JAGUAR GUIDE

by John Bentley

MODERN SPORTS CAR SERIES

Illustrated, $1.95

THE JAGUAR GUIDE

by JOHN BENTLEY

Cover photo by Robert Halmi

A thorough and detailed account of the development of one of the world's finest sports cars. The author discusses every sports model the company has produced, from the early SS-90 to the D and the XK-SS.

Engineering, design, performance, racing records–nothing is omitted. There is even a chapter on the people who build the Jags. And then, finally, the book contains complete maintenance and servicing information and technical data for every model.

A guide in every sense of the word–one that all Jag owners and would-be owners will read with pleasure and profit.

John Bentley's numerous articles and books on sports cars, published both in the U.S. and in Europe, have earned him international recognition as an authority on this subject. He has at various times owned or test-driven just about every outstanding make of sports car.

As a racing journalist who writes from personal experience behind the wheel of competition sports cars, John Bentley's position is today almost unique in the U.S. In a backlog of some 84 road races, he has competed in five 12-hour, two 6-hour, and one 24-hour race and scored many outstanding wins and places. In 1952, driving a privately entered Jaguar XK120-M, he placed third behind two factory-sponsored C-Type Jaguars in the Elkhart Lake 200-mile road race. In 1954, with 9 first and 11 second places in 20 starts, his Siata was runner-up in the National Class G SCCA Championship. In 1956, co-driving a British Cooper at Le Mans, Bentley finished second in class, fifth on Index of Performance, and eighth overall. Only 14 of 49 starters finished this grueling 24-hour classic which included 20 hours of driving in the rain.

Currently, the author is busy with several automotive books. He writes regular monthly features and a sports car column for SPEED AGE magazine. No writer is better qualified to tell the fascinating story of the Jaguar car.

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Sir William Lyons, founder of the Jaguar fortunes and a key figure in the British motoring industry.

Guide to
THE JAGUAR

The complete story of the famous Jaguar car

By

JOHN BENTLEY

New York
SPORTS CAR PRESS

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To

My good friend

ALVIN BOJAR

without whose assistance this book
might never have been written.

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1. BIRTH OF THE JAGUAR

Jaguar Cars Ltd. is one of the most distinguished and prosperous of automobile manufacturers in the world today. But so traditional is the story of its humble origins that newspaper and magazine writers are fond of telling how young Bill Lyons, later Sir William, began in business with "a partner, an idea, a heap of enthusiasm and a small overdraft." There is only a touch of poetic license in the story—the overdraft was guaranteed by two obliging fathers.

World War I was over, and the motorcycle and sidecar, the jeep of 1917, had followed the soldiers back to civilian life. This ubiquitous and practical vehicle had an enormous postwar vogue and its popularity could be attested to on every road and byway in England. It was quite the thing then for a young blade to take his lady for an outing in a "chair", as sidecars were called. By 1922 "chairs" were buzzing all over the landscape.

In Blackpool, 20-year-old Bill Lyons had caught the cycling fever. However, his great enthusiasm was tempered by both disappointment and hope. He was quite disappointed in the chairs then being produced—plain, with no emphasis on design, bare in their fittings. His hope lay in what he wanted to do most—build a better and cheaper chair. On his 21st birthday, Lyons, his partner Bill Walmsley and a staff of five moved into a small side street workshop and went into business as *The Swallow Sidecar and Coach-building Company.* He met his challenge head on; a better chair, a quality chair and at bargain prices. He called his chair the "Swallow." It was elegant, racy, comfortable, well sprung, decently painted and weatherproof.

One week after Swallow Sidecar opened for business, the young entrepreneurs applied for a stand at the 1922 Motor Cycle Show. When the public got a look at the new, sleek, carefully built Swallow, the order books began to fill. "They gave us a very small space in a remote corner," Lyons recalls. "A month later we were not only on show, but in production." The business grew rapidly and was soon doing so well that Lyons began to look elsewhere for new challenges and new fields to conquer.

By this time it was beginning to be obvious that the automobile, not the sidecar motorcycle, was the vehicle of the future. The young lads and lassies liked the adventure of dashing over the roads in an open chair—in fine weather. But for all-round transportation, a little more comfort and some protection from the wind and rain were required. The market for automobiles encompassed all ages and types. The appeal of the sidecar did have its decided limitations.

Most popular car of the day in England was the Austin Seven. At first the butt-end of jokes and a subject of derision due to its small size and ungraceful appearance, the "Baby Austin", because of its low price and economy of operation, soon won an economic and sentimental place in British motoring very similar to that of the beloved Model T Ford in the United States.

Lyons had decided that his next step would be the designing and building of automobile coaches (bodies), and the popular Austin seemed an ideal vehicle to start with. If he could build a more stylish body on the rugged little Austin chassis, a whole new automobile market could be tapped. He approached the Austin people with the idea; they were agreeable, and Lyons contracted with them to buy engines and chassis in lots "of about 50."

The attractive and comparatively lavishly equipped Swallow bodies built on the Austin Seven chassis were sold as the "De Luxe" models and cost only $50 more than the standard Austin Seven. The Austin-Swallow, as it was called, sold for £187, then about $935. It was an instant success and orders for the new model came pouring in to the Austin Offices in Birmingham. Austin delightedly loaded hundreds of its chassis and engines onto railroad cars and shipped them on their way to the Swallow plant in Blackpool.

The station master at Blackpool soon found his sidings piled high with chassis, which the Swallow Sidecar and Coachbuilding Company was unable to accept. Austin had no idea that the small workshop on Cocker Street was geared to a maximum output of two bodies per day, and had little if any storage space!

Lyons was left with no choice but to expand—and produce. It was weeks before the sidings were cleared and the station master once again resumed his uneventful existence, but by that time, the young businessmen had learned to produce automobile bodies in quantity without sacrificing quality. It was this training that later proved to be the making of Bill Lyons. Austin-Swallows rolled steadily out of the little plant, and in the next few years Lyons began producing custom bodies for several other automobile manufacturers: the Standard-Swallow, Swift-Swallow, Hornet-Swallow and even a Fiat-Swallow.

By 1928, the growing coachbuilding company had far outstripped the facilities of its Blackpool plant. Lyons then decided the time had come to move his concern right into the heart of the motor industry, which was Coventry. He, Walmsley and their workers loaded all the equipment into wooden crates and shipped the whole works off, addressed to a shell-filling factory that was a large one-time war plant, but now housed several small manufacturers. In it Lyons had rented a bay. By the winter of 1928, the Swallow Sidecar and Coachbuilding Company was firmly established in Britain's Detroit. With more room and an improving fiscal set-up due to the continuing successful sales of his Swallow coachwork, Bill Lyons was ready for the biggest venture of his life, that of designing and building his own cars.

He wanted a car of his own—big and imposing—one with an identity and a personality.

The enterprising young businessman took his proposition to Captain John Black (now Sir John), president of the Standard Motor Company. Standard would supply Swallow with chassis and engines as they had for the Standard-Swallow, but this time they would be built to Lyons' own design. Captain Black agreed.

It was midsummer of 1931 when Standard sent the first of these special chassis across Coventry to the Swallow plant over on the north side to be fitted with Lyons' new bodies.

There were two versions of the new model, which Lyons had intended to call the Swallow Sports. Captain Black, anxious to keep this product identified with his company, proposed Standard Special. In the end, Lyons suggested that they compromise and just use the common initials SS. This was found to be agreeable. The two models were the famous SS-I and SS-II.

The chassis Lyons had designed for the SS-I was extremely long, with underslung suspension front and rear, providing a very low center of gravity and permitting body designs with extremely low silhouettes. The SS-II had a similar chassis, 19 inches shorter, and was powered by a stock version of Standard Company's "Little Nine" engine.

On these chassis, Lyons built probably the most rakish-looking automobiles seen up to that time. Long, low, handsome, they had an extremely long hood line from which the full cycle-type fenders swept sharply down around racy wire wheels. Only 54 inches high and carrying no running boards, they anticipated design features that came many years later.

In October, the SS models were presented to the public at the London Annual International Automobile Exhibition held at the Olympia Exhibition Hall. There, in a booth occupying a remote corner of the hall, sat the "big, bizarre, low-built, long-bonneted sports saloon of 20 horsepower," as the SS-I was described in one newspaper. The new cars of Bill Lyons were a sensation. The national press was unanimous in calling it "The car of the Show." Everywhere people were asking questions.

"How much does it cost?"

"What'll she do?"

"Who designed it?"

"Is it in production?"

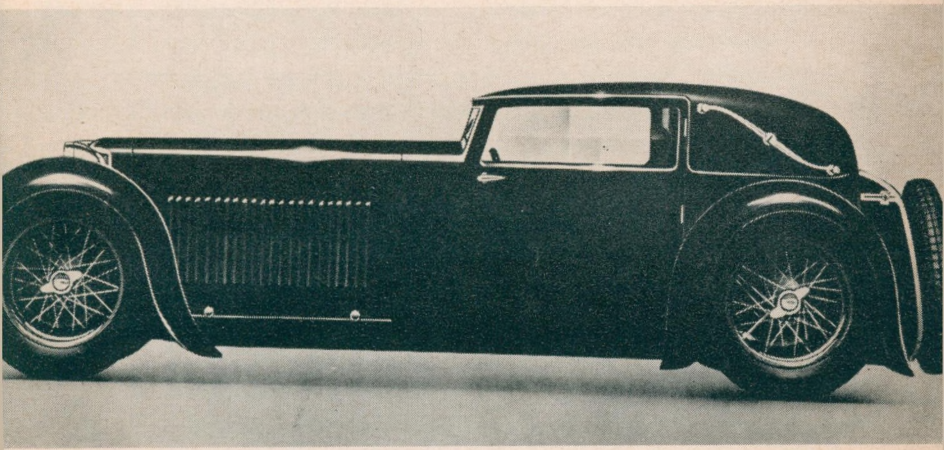
When the price of the car was announced at £310, or a little over $1500, both public and press alike were astounded, and one major daily in a banner-headline paid the newcomer the ultimate in compliments by coining the perfect advertising slogan for the SS-I: "The Car With The £1000 Look."

The spectacular publicity and torrid public reaction began to pay off immediately. Frank Hough, president of Henly's, Britain's largest automobile distributor, approached Lyons at the show.

"Mr. Lyons, I'm Frank Hough, president of Henly's."

"How do you do, sir," was the calm reply.

"I don't know what your production schedule is, but I'll give you a contract for the whole lot."



The first SS-I.

Lyons, his pocket bulging with orders, smiled and settled for half his next year's output of 1,000.

The story of the SS-I is an example of the technique with which Lyons has built Jaguar Cars into the huge industry it is today. He achieved a new kind of design and production breakthrough by offering a combination of features not previously available—daringly racy and beautiful lines, luxurious finish and fine workmanship, all at an astonishingly low price. It was Lyons' own rare combination of talents that made such an achievement possible; he is simultaneously a designer with a remarkable eye for line, an energetic production man with a flair for getting quantity and quality at low cost, a salesman with an understanding of publicity techniques seldom found in British industry, and a forceful, hard-headed businessman.

As his business acquaintances and associates working with him have remarked, one of Lyons' basic business principles is to treat success merely as a jumping off point for further endeavor. The overnight success of the SS-I (far outstripping the less spectacular SS-II) set Lyons immediately to planning new models under the SS name.

He was well aware that the SS-I, which looked faster than speed itself, only gave a so-so performance with its 43-hp engine. It looked fast just sitting still, and this alone was enough to sell it at first. But unfortunately, nothing much happened when the foot went down on the accelerator, and he knew it was time to prepare for the day when the novelty wore off.

Back to the drawing board he went. In a matter of months, a newer, more powerful engine was ready, offered as an alternative choice. This larger engine displaced 2663 c.c. (163 cu. in.) and developed about 100 horsepower. Here again was the beginning of another company practice. From 1932 on every new SS model presented had an engine giving more power for its size than the previous one.

By this time the tail was wagging the dog, and the sidecar business had become a sideline to the automobile factory. In 1933 they were separated. The automobile plant was incorporated as *SS Cars, Ltd.,* while the original Swallow Sidecar and Coachbuilding Company continued as a separate entity up to World War II.

Progress was rapid. The new 1933 SS models had bodies sporting long sweeping fenders in place of the motorcycle type, and larger more powerful engines. The firm which five years before had occupied one bay in the old shell-filling factory now owned the entire half-million-square-foot plant and the 13 acres of ground upon which it stood. More than a thousand men were on its payroll.

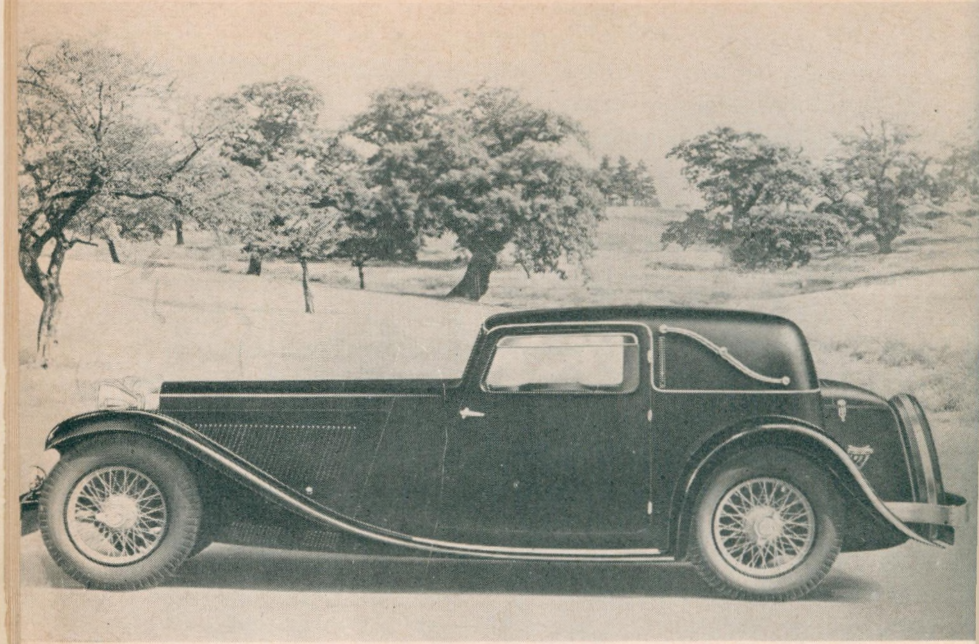
Lyons, however, was still dissatisfied with his car's performance. The SS-I just wasn't as fast as it looked. It did a little more than 75 mph before pleading with the driver for a rest. Feeling that his design was being spoiled by below par performance, Lyons decided to hire an engine specialist to give the car more speed. The man he chose was a young engineer from the Humber car plant named W. M. Heynes.

Heynes, who today is Chief Engineer and Vice-President of Jaguar, was as much a genius in engine design as Lyons was in body styling, and he went right to work to improve the side-valve L-head engine which Standard had been building for Lyons. He installed such advanced features as a special dual-carburetor manifold, scrapped the old cylinder head and pistons and replaced them with aluminum parts. He raised the compression and replaced the connecting rods with better ones designed of light alloy. The combustion chambers in the new head were reshaped and specially machined; the inside surfaces of the engine also were accurately machined and polished throughout.

The new models with their hopped-up Heynes engines performed much better. They would pull a 4.25:1 axle ratio as compared with the 4.66:1 on the older models; and they would reach a top speed of about 85 mph. But the L-head power plant has inherent limitations, and Lyons and Heynes had now taken it about as far as it would go. It was apparent that totally new departures would be needed in designing any further cars.

Lyons by now was dreaming of an entirely new line. He wanted to make a smaller car with a high power-weight ratio. The beautiful and impressive SS-I and SS-II models were luxuriously appointed machines with a "sporting flavor," but they were actually custom-style coachwork built over regular production engines and chassis. What Lyons now wanted was a genuine sports car for the dyed-in-the-wool sports car enthusiast group that by 1934 had already grown up in England.

Spurred on by the progress Heynes was making in engine design, Lyons began work on a real speed-wagon, a car with a high power-to-weight ratio that would crack the sports car market. When it was finished, it was introduced as the SS-90. The "90" stood for its rated top speed, and the use of the car's maximum miles-per-hour rating

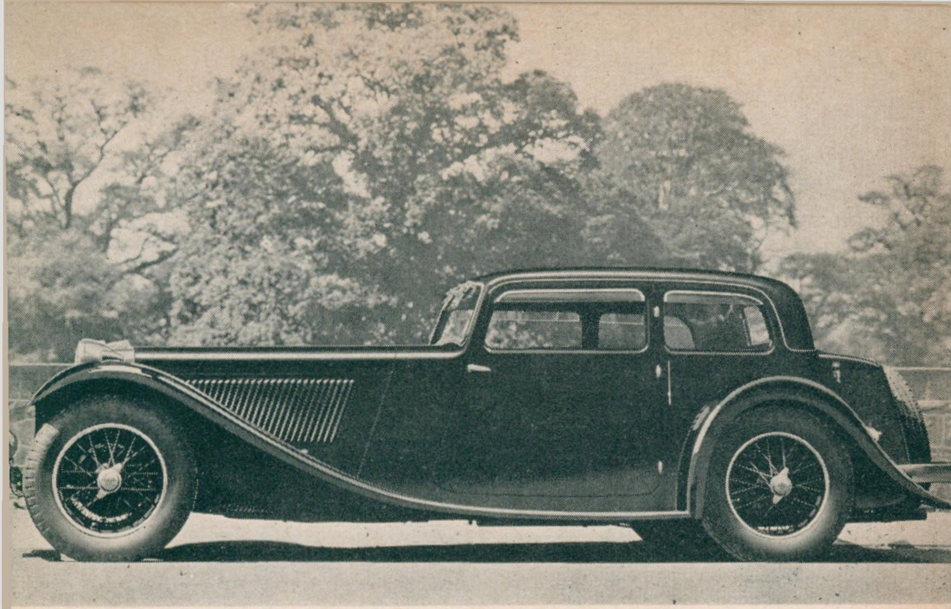


The SS Coupe, produced in 1934, was a big hit with the British public.

in its numerical designation became a Jaguar tradition. The SS-90 may be called the true ancestor of the present day Jaguars.

The SS-90 had an all-aluminum body looking somewhat stark and functional in the classic sports car tradition, yet it retained Lyons' already famous graceful flowing lines. The running boards swept forward and upward into a regally flowing fender line, which terminated well ahead of the radiator in impressive classic fashion. Enormous, arrogant, chromed headlights adorned the grillework, and the long narrow hood bespoke speed and power. The car was built on a 104-inch wheelbase, weighed 2184 pounds and did an honest 90 mph. The engine was Heynes' hopped-up version of the SS engine with the addition of a high-lift, extreme-overlap camshaft.

The car was sensational enough, but not for Lyons. With his inborn flair for advertising and publicity, he knew instinctively that while 90



The 1934 SS-I four-light, two-door saloon. This was the last model produced under the name SS, before the name change to Jaguar.

miles per hour is an impressive figure, it lacked the magical flavor of "100." "All right, it's fine," he said, "but I want a hundred!" There was a goal to shoot for! The publicity value would be enormous. Meantime the SS-90 was to become a true collector's item, for less than one hundred were actually built. As for Heynes, he was turned loose on a campaign to design and build the 100 miles-per-hour engine.

Both Heynes and Lyons realized that the whole engine would have to be redesigned. They had reached the optimum in their present power plant, using the old Standard side-valve engine. Working steadily and long into the night, Heynes within a year had developed a six-cylinder, pushrod-operated overhead valve engine of 2,663.7 c.c. (162.49 cu. in.). With a much higher compression ratio than that of the old engines, it developed 102 bhp. Later, with the engine bored out to 3.5 litres (214 cu. in.), this was raised to 120 bhp.

All this work was carried on in secrecy and behind locked doors. When it was finished, Lyons, still not wishing to take the gamble of tooling up for the manufacture of his own engines, gave the plans for the new power units to Standard, which prepared a special plant for their manufacture.

While Standard was making preparations to produce the new engines, Lyons decided that it was also time for a new car. The superb new power units would deserve a proper package. He decided to restyle SS body work from the ground up, rather than just produce a warmed-over and face-lifted Standard.

The new car would also need a striking name to differentiate it from the old SS line and to give it a personality of its own. Ever mindful of the showman's principles that had got him and his cars so much attention in the past, Lyons ordered his publicity department to prepare a list of all creatures that could walk, crawl, swim or fly, from which to choose a name.

They went to work with a will. Even after eliminating the names already in use, including Hawk, Tiger, Viper, Hornet, Firebird, Eagle, Greyhound, Lynx, Weasel and Gamecock, and omitting such choice morsels as Toad, Pig, Sloth, Platypus and the like, they came up with a list of more than five hundred beasts, fish, fowl and insects not yet on wheels. The list was rushed to Lyons. He studied it for awhile and then made his characteristically swift and uncompromising decision. "I like the sound of Jaguar," he remarked, "It has everything we want—power, speed and grace."

By 1935 the Jaguar was ready to be presented. Engraved invitations went out, and at London's swank Mayfair Hotel two hundred dealers and members of the press congregated to witness the preview showing of the new SS-Jaguar.

As he looked over his audience, Lyons was struck by the excellent opportunity afforded him to gather some valuable publicity. He ordered slips of paper passed around among all his guests, and then mounting a small podium he asked everyone for guesses as to the car's price. Upon a given signal, the wraps were taken off and the new Jaguar unveiled.

The audience gasped. It was a magnificent car, with luxurious appointments and the most advanced styling features. After the initial shock was over and all guesses were written down, the slips were collected. There were guesses of £445, of £600, even of £850. Then, in an atmosphere of carefully built-up tension, the price was announced. It was £385, or about $200 less than the average of all guesses. In terms of dollars, this represented $1925, but not one member of the audience had put down a figure lower than the actual selling price.

The new Jaguar had been designed for the conservative market, and was an addition to the regular sports models then in production. In October, when shown to the public for the first time at the London Motor Exhibition, the SS Jaguar was an instant and profitable success. Big, elegant, it brought within everyone's reach a car with looks that up to then had only been available in very high-priced saloons. Thus was born the epithet of "The Poor Man's Bentley," a grudging acquiescence of the excellence of its style and quality.

The price tag, of course, was the key to Jaguar success. From the very first model produced, the company was doing the near-impossible. It was producing cars in the best classic British tradition, fitting them with all sorts of luxury appointments, and selling them at ridiculously low prices. The cars looked custom made, with dashing wire wheels, large chromed head lamps, leather upholstery, wooden dashboards and graceful sweeping bodies built so low that they could practically drive under most of the other cars of their day.

The 2.7 litre engine had a high power output obtained from skillful design of the cylinder head in the matter of "breathing." That November's edition of the *Automotive Engineer* said in review of the new model:

> The crank case and crankshaft have been strengthened up to deal with the increased power output, the connecting rods being of RR 56 alloy with white metal bearings. The cylinder block is of chromidium iron, and Nelson Bohnalite pistons without a split skirt are employed. The overhead valves are in line, the inlet valve being larger than the exhaust. The inlet ports are fed from a gallery that runs the full length of the head and is machined straight through. Each induction port is

in contact with its own exhaust port. The whole system is included within the water jacket.

Heynes' new engine had a compression ratio of 6.6:1 and developed 102 bhp. The 30-degree valve seats plus the shape of the ports gave high volumetric efficiency. The frame was particularly noteworthy. It was diagonally braced, underslung at the rear with rear springs outside the longitudinal members, thus making it both strong and stable.

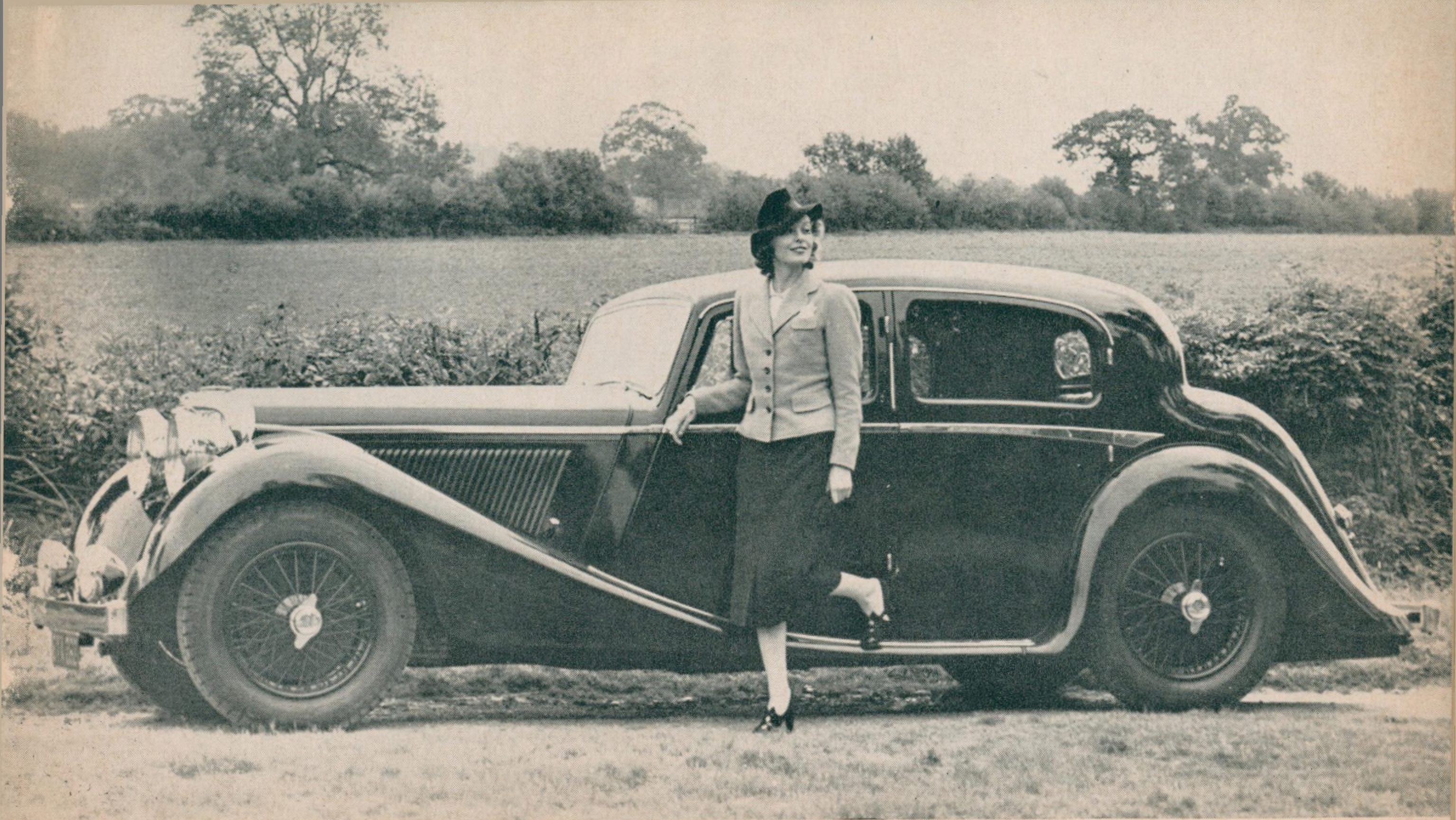
The automotive press probably reached the ultimate in British accolades when, commenting upon its manufacture, it said, "The construction in detail is praiseworthy."

As the company entered into 1936, the new SS-Jaguar 2½ litre was selling very well. Then early in the year, Heynes announced that his new engine was set for production, and the famous SS-100 was ready.

The SS-100 used the same chassis as the SS-90 and was outwardly similar, but it had a special feather in its cap. This was the new Jaguar "power pack" now under its bonnet, which enabled it to do a true 100 mph. The price: $1925.

Heynes had been working on two engines at once while aiming towards his 100 miles-per-hour goal. The second was of the same basic design, but was a 3½ litre job. Offered as an alternative to the 2.7 litre, it did a good 105 mph, went from 0 to 70 mph in 14.7 seconds and sold for $2175.

With the new engines giving better than 100 mph and the racy lines causing people to stop and stare, it was almost to be expected that the SS-100 would be a best seller. Still Lyons adhered strongly to his principle of quality workmanship. The bodywork on the SS-90 and SS-100 was superb. The *Automobile Engineer* commented at the time in an article entitled "Producing S.S. Bodywork."



First of the Jaguars, produced in 1935. All-steel body was a breakaway from traditional coach work of steel panels on an ash frame.

> . . . The bodywork of S.S. cars . . . is comparable with high-class specialist designs, and is not of a character generally regarded as suitable to quantity production methods. That such methods have, however, been successfully applied to this type of coachwork is proved by the retail prices . . .

Naturally enough, with a car of the SS-100's appearance, power and low price, a large and vocal group of racing enthusiasts emerged. Despite its 100-plus miles-per-hour and its look of violent speed, the SS-100 was considered a "soft" sports car by the "dicing" fraternity. Its semi-elliptic springs were adequate for ordinary fast motoring, but at racing speeds there was a tendency toward front end instability. This is not to say that the car failed to garner its own hard core of fans, for in spite of this shortcoming the car handled remarkably well and offered startling performance for the money. It had line and character, and though admittedly not a Bugatti, it was still one of the most beautiful cars ever built, with rakish classic lines that to this day cause people to stop and stare.

Criticism of the racing ability of the SS-100 was in fact not entirely justified. It was company policy not to enter factory cars and drivers in competition, and those elements of handling and performance which can only be discerned under severe racing conditions were thus unknown except through reports of owner-drivers. Consequently they were not emphasized for revision in the car's manufacture. However, whenever cars are raced, they are always torn apart and criticized by racing standards and criteria, whether the design was intended for racing or not. Lyons had pointed out on many occasions and with considerable historical accuracy that concentration on racing was the quickest possible way for a company to lose money. His motto consistently was "Let the customer do it," and he steadfastly refused to enter factory cars in any competitive motor sports. This attitude stemmed much less from stubborness than from hard-headed business judgment. If a customer were to win a race, there was all the more glory, for the car hadn't been specially prepared or professionally driven. At the same time, this policy avoided the very great expense of getting deeply into competition. If the customer happened not to fare too well, it bore no direct reflection upon the company.

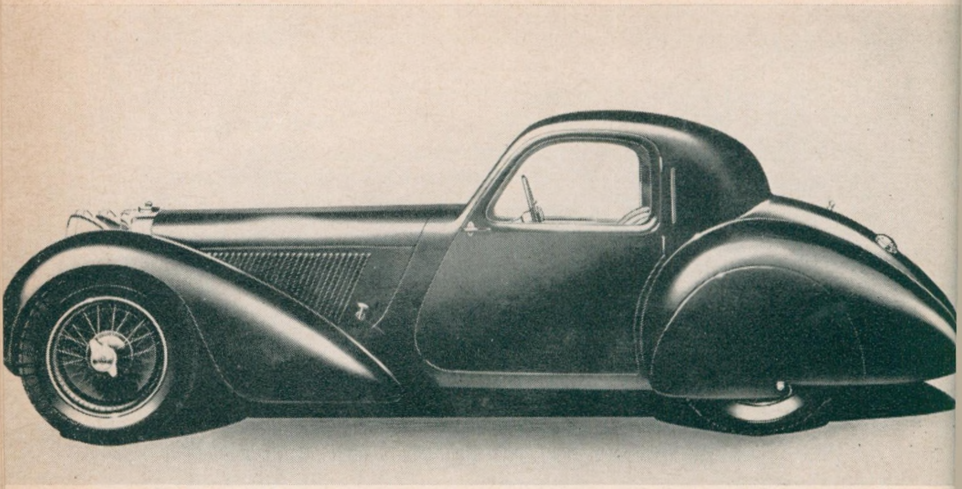
However, on many occasions the customer "did it," and the SS-100 came home with various impressive victories. It won or placed high in a number of important events, such as:

The Marne Grand Prix
The International Alpine Trial
The Monte Carlo Rally
The R.A.C. British Rally
Brooklands Club races.

SS Cars, Ltd. had come a long way from its early days of building bodies to fit on the Baby Austin. By mid-1936, the company was in a sound financial position and had an attractive line of products. As a direct answer to the MG, a four-cylinder 1½ litre model had meanwhile been introduced, to cash in on the small car market. This market, which still exists widely in England, had for its impetus an absurd tax system based on horsepower ratings. The 1½ litre SS-Jaguar sedan was built on a 108-inch wheel base and its engine developed 46 bhp. It had four forward speeds and downdraft carburetion.

With the little 1½ litre model filling out the line, SS Cars, Ltd. now produced 1½, 2½ and 3½ litre sedans and convertibles as well as the 2½ and 3½ litre 100 mph sports cars.

Viewing his company objectively, Lyons now saw what seemed to him to be an obvious need to reorganize and consolidate. His first step was to turn SS Cars, Ltd. into a public company, and at this juncture, his original partner, Bill Walmsley, chose to resign. With the additional money gained through stock subscription, Lyons expanded his factory, increased and modernized his equipment and material and planned for the future. The next several years were years of consolidation of past progress. During this period no new or additional models were produced, nor were there any major design changes. Existing cars were smoothed out and improved and with each new year came added refinements, slicker styling and higher



An early prototype of the Jaguar Fixed Head coupe which never went into production. Body was mounted on the old SS-100 chassis in 1939.

road performance to further glamorize the sum total of Jaguar appeal.

By 1939, it was apparent to Lyons and Heynes that the Jaguar engine once again had no place to go. For the second time, they had carried the existing power plant to the limit of its inherent possibilities. And Lyons foresaw that with this period of reorganization and consolidation complete, it would be necessary to bring out a revolutionary new line of cars. The first prototype of what later became the XK 120 had reached the scratch pad stage, and matters were being arranged to get it ready for the drawing boards. At this time, unfortunately, with the "shape of things to come" forefront in Lyons' mind, a distorted vision of the shape of things to come arose in a dictator's mind and the continent of Europe was plunged into another disastrous war.

2. BIRTH OF THE XK120

When World War II was over Bill Lyons quickly swung his Coventry factory back into automobile production. Within six months, unfinished aircraft contracts were being completed on one side of his plant, while the incongruous sight of a production line of new automobiles was coming down on the other side. During the war SS Cars, Ltd. had been a major airplane producer. In order to provide for war commitments the plant had been further expanded. Given this extra space and equipment to work with, Lyons decided the time had come to build his own engines, and he accordingly completely re-equipped the engineering division with all the necessary machines and tools. At the same time, the name of the company was formalized to Jaguar Cars, Ltd., since the memories evoked by the initials "S.S." were not calculated to foster enthusiasm.

The postwar position of Great Britain soon became painfully clear. With its finances severely damaged by the intolerable burden of financing a war economy, there was no choice but to export or starve. The entire British economy was therefore so oriented. Only those companies ready to produce for export received the necessary priorities to obtain valuable rationed materials. Upon those firms building up dollar markets, His Majesty's government smiled most benignly.

Lyons was off his mark and running, and in a minimum period of time had his Export Division organized and in business. Soon many Americans looked up to see the new Jags go by. In the car-starved world of 1946 anything living or dead that bore the title "automobile" found a ready market. The Jaguar that Lyons put out was called the Mark IV, and (like every other automobile manufactured that year) was almost identical to the prewar model.

The Mark IV was produced so swiftly that it came over to the United States equipped with right-hand drive. Even this, and its stiff "cart" suspension, which made it feel a little like a contestant in the soap box derby, did not dissuade buyers. Demand, in fact, quickly exceeded supply. It can be said that the Mark IV performed well, was finished with a degree of luxury not equaled in Detroit postwar production and had a decidedly "classic" look that appealed to a surprisingly large number of American motoring enthusiasts.

All automobile manufacturers were now hard at work with new models in anticipation of the competitive market that would soon re-emerge, and Lyons started to dig in to those drawings and sketches that had been laid aside seven years before.

The new revolutionary model could not be rushed. Lyons decided that his entirely new car would not be brought out until it had been thoroughly subjected to every known test. The engine, which bore the mysterious appellation "X" in the drawing office, had already undergone several revisions. With each revision the name of the engine progressed—XA, XB, XC and so on.

It was apparent at the start of development work on the new "X" engine that the existing range of engines had been evolved as far as was economically feasible, and efforts to extract higher horsepower and a greater speed range brought out the inherent limiting factors which existed in this type power unit. It was also obvious the new range of engines had to fall approximately within the same two groups in which the firm had built its reputation, as that market had been carefully established and numbered a vast body of devotees. In addition, the new engines had to be sufficiently advanced in design so as not to need any major changes requiring re-tooling before the high cost of the necessarily new equipment had been amortized.

To enable tooling costs to be kept at a minimum, it was desirable that so far as possible the parts on the two units be interchangeable, and more important, that both be produced at the same plant and with the same equipment. This led to the decision to go ahead with a four and a six cylinder unit, the reasons being that common tooling could be accommodated, common parts employed and that the plan conformed to the market Jaguar had already spent so much money and time in developing.

Other combinations were considered, studied, discussed and rejected. For instance, the four cylinder and a V-8; or the six cylinder and a V-12. Neither of these was expedient. The huge market potential that Jaguar wanted to tap was in the United States, where a reasonably priced British car able to compete with America's best in performance and roadability should be able to sell its fair share.

At first, it seemed necessary to sell both the four and six cylinder engines in sufficient quantity to make manufacturing an economical proposition. But the export drive, it later turned out, eliminated the need for bringing the four cylinder version into production, although most of the initial development work on this power unit was completed.

Lyons had laid down a strict set of requirements for the new engine. It had to be capable of moving a full size sedan at a real 100 mph in its standard form without special tuning. To achieve this without sacrificing bottom-end performance, it was obvious that the normal safe operating range of the engine would have to be increased well above that of any series of production engines operating at that time. An arbitrary peak for the power curve was thus set at 5,000 rpm, a figure well within the range of the engine as finally developed.

The final requirement, (and one which nearly all automobile designers ignore), was the styling of the external appearance of the engine to make it look like the high-speed efficiency unit it was. For thereby could be conveyed to the layman some idea of the thought and care expanded on the design and construction of unseen functional parts.

The aim, therefore, was a series of engines with a much higher basic performance than is normally obtainable, which would not call for constant revision of design to keep up with competition. Most important, the engines had to be a sound production proposition that could be produced at an economical cost—both power units to be manufactured at the same plant and with the same tooling.

This new series was started on a "clean sheet of paper" with the full confidence and support of Lyons. The design was to be new from the bottom up with no concern for existing tools and equipment. Brought in to assist was none other than Harry Weslake, one of the world's greatest experts on engine breathing problems. The responsibility of the project was shared by Heynes and his two colleagues, C. W. Baily and W. Hassan.

Development work on the X engine was done on four cylinder models. As each engine hit the drawing board, it was carefully dissected and minutely examined to see if it measured up to the rigid specifications required of it. XA was studied and discarded. Then XB, XC, XD and XE. All were found to be unfeasible.

Starting with the XF, Heynes, Weslake and their engineers began to close in on their prey. Some of their conclusions are listed below.

XF Four-cylinder. 66.5 by 98 m.m., swept volume, 1360 c.c.

First twin O.H.C. engine made. Designed primarily to prove type of head and valve gear, which it did. Crankshaft design inadequate for very high speed at which engine would operate.

XG Four-cylinder. 73 by 106 m.m., swept volume, 1776 c.c.

This was really a conversion of the existing Jaguar 4-cylinder push-rod engine. The push rods and rockers were found to be difficult to silence to the standard needed for a touring sedan engine, the valve spring pressures being very high for high-speed operation. Also, flow figures through vertical ports equal to those obtained with horizontal ports could not be obtained.

XJ Four-cylinder. 80.55 by 98 m.m., swept volume, 1996 c.c.

This was the true forerunner of the later XK design, inasmuch as it was on this engine that most of the experiments with port and head design took place. Numerous tests were carried out on valve gear and camshaft drives. It was one of these experimental 2-litre engines, fitted with modified pistons with a 12:1 compression ratio, that was loaned to Col. Goldie Gardner when he took the World Speed Record in the 2-litre class. In this condition the engine developed 146 bhp at 6,000 rpm, with a maximum safe speed of 6,500 rpm. The car Col. Gardner used reached a speed of 176 mph.

XJ Six-cylinder, 83 by 98 mm., capacity, 3.2 litres.

This was the first six of this type made by Jaguar. It was intended to replace both 2.5 and 3.5 litre push-rod engines with a single unit. Experience later showed, however, the need for higher torque at low speeds, which was most readily obtained by an increase of stroke. The resultant engine formed the production six-cylinder unit.

XK Four-cylinder

As this engine, (a further refinement of the XJ,) was withdrawn by Jaguar in favor of the six-cylinder and has never been released to the market, full details are not available.

XK Six-cylinder. 83 by 106 mm., capacity 3448 c.c.

This represented the final production engine and is fully described elsewhere in the book.

The experimentation and testing of the new engine was taking time, and in the interim, to fill the gap and keep up with competition, which was offering new model changes in 1948, Lyons introduced the Jaguar Mark V. It was merely a stop gap measure to gain further time in which to fully test the new engines.

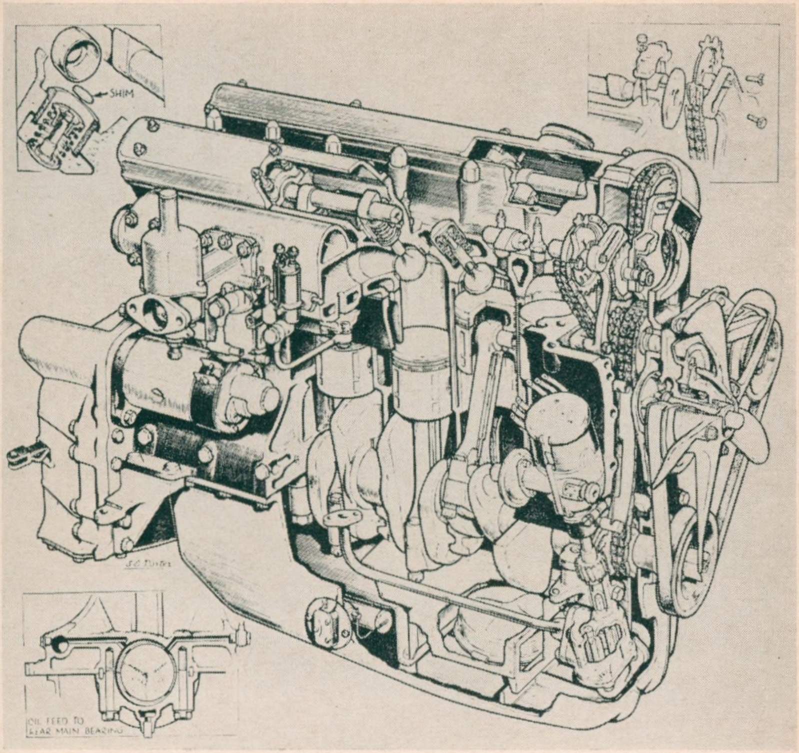
The new Mark V series was powered by the same type of O.H.V. engine as the preceding models, but was now offered in two power categories, a 2½ litre (2663.7 c.c.) and a 3½ litre (3485 c.c.). The sedan and convertible coachwork was restyled. The car also had several engineering and design improvements, some of which were being tested and which later became part of the new XK Jaguars. The old front semi-elliptic springs were scrapped and replaced with independent front suspension of the torsion-bar type. The stopping power was improved with the use of full-hydraulic two-leading-shoe brakes. Outward appearance was modernized and spruced up by use of disc wheels, built-in headlamps and fender skirts. Many other appointments were featured as standard equipment and though the car fol-

The Mark V saloon, first major design change in postwar Jaguars, had independent front suspension.

lowed neither vintage nor modern lines, its overall appearance enhanced by a number of luxurious details, was graceful and aristocratic.

The engine was fundamentally the same as that of the Mark IV and the prewar power plant, and had the same bore and stroke dimensions. Its output, though, was beefed up to develop 125 bhp at 4,250 rpm with a 6.75 : 1 compression ratio.

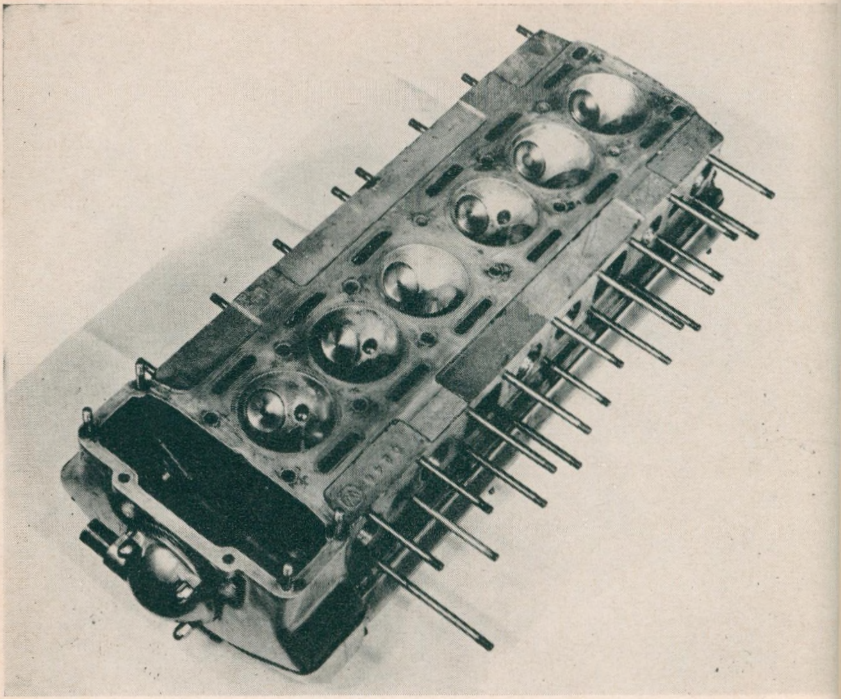
While the new Mark V was being introduced, the two new XK engines 90 bhp, four cylinder and 160 bhp, six-cylinder had been built and installed for test purposes into carefully disguised cars. These cars were driven under the most severe and intolerable conditions that could be found. Across the continent of Europe, the drivers



Cutaway of the Jaguar XK-120 engine.

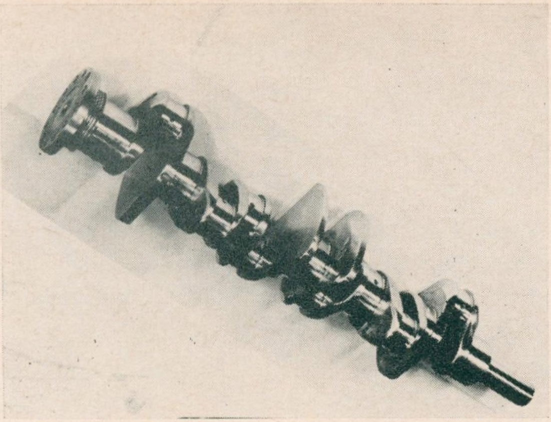
gave the engines a work out, taking them from the extremes of cold to extremes of southern heat, up alpine roads, over rugged hills and the back ruts they glibly call highways in less frequented parts of Europe. When the Jaguar engineers felt certain that the new engines were ready, a hand-made prototype was placed on the newly designed chassis and Lyons' revolutionary body was bolted down.

Lyons had decided to produce only a roadster-type model at first. His reasons were in great part dictated by sound and conservative business economy. The engine had originally been designed for sedan use. But the Jaguar firm was now thinking in terms of using the XK power plant throughout the entire line of Jaguar cars. Before going



Cylinder head of the XK engine has perfect hemispherical combustion chambers and centrally located spark plugs.

ahead with the tooling up for the engine and the enormous cost it would entail, Lyons decided to give it a final testing. There are many types in the strange breed that we call automobile drivers. They are ingenious, sadistic and even down right brutal. Their capacity for submitting the cars at their disposal to tortures unheard of since the days of the inquisition, (and certainly beyond the wildest imagination of the average automotive test driver) needs little comment. Lyons reasoned that there could be no better way to put the new engine through its final paces than to submit it to the whims and fancies of 100-plus mph American speed enthusiasts. These boys would sub-



Crankshaft of XK engine is a beautifully machined job with robust throws and extra large diameter (2¾ in.) bearings.

ject the car to every test known and to a few unknown ones besides. The chances were also that they would prove reasonably tolerant of defects and would be concise and accurate in reporting their observations. This method of testing would also prove much cheaper.

And so it happened that the Jaguar XK 120 Super Sports was first presented to London automotive society at the Earls Court Motor Exhibition in 1948. The motoring world was startled. It was apparent to everyone that here was a radical departure from the earlier type of engine, for in place of the more normal push-rod operated valve mechanism, the new Jag XK was of twin OHV camshaft type, and plainly of the most advanced design. Sample comments:

"They say it will cost $7,500."

"Those new engines are so full of bugs, it will teach them to bring out such a complete change."

"You say it has five forward speeds?"

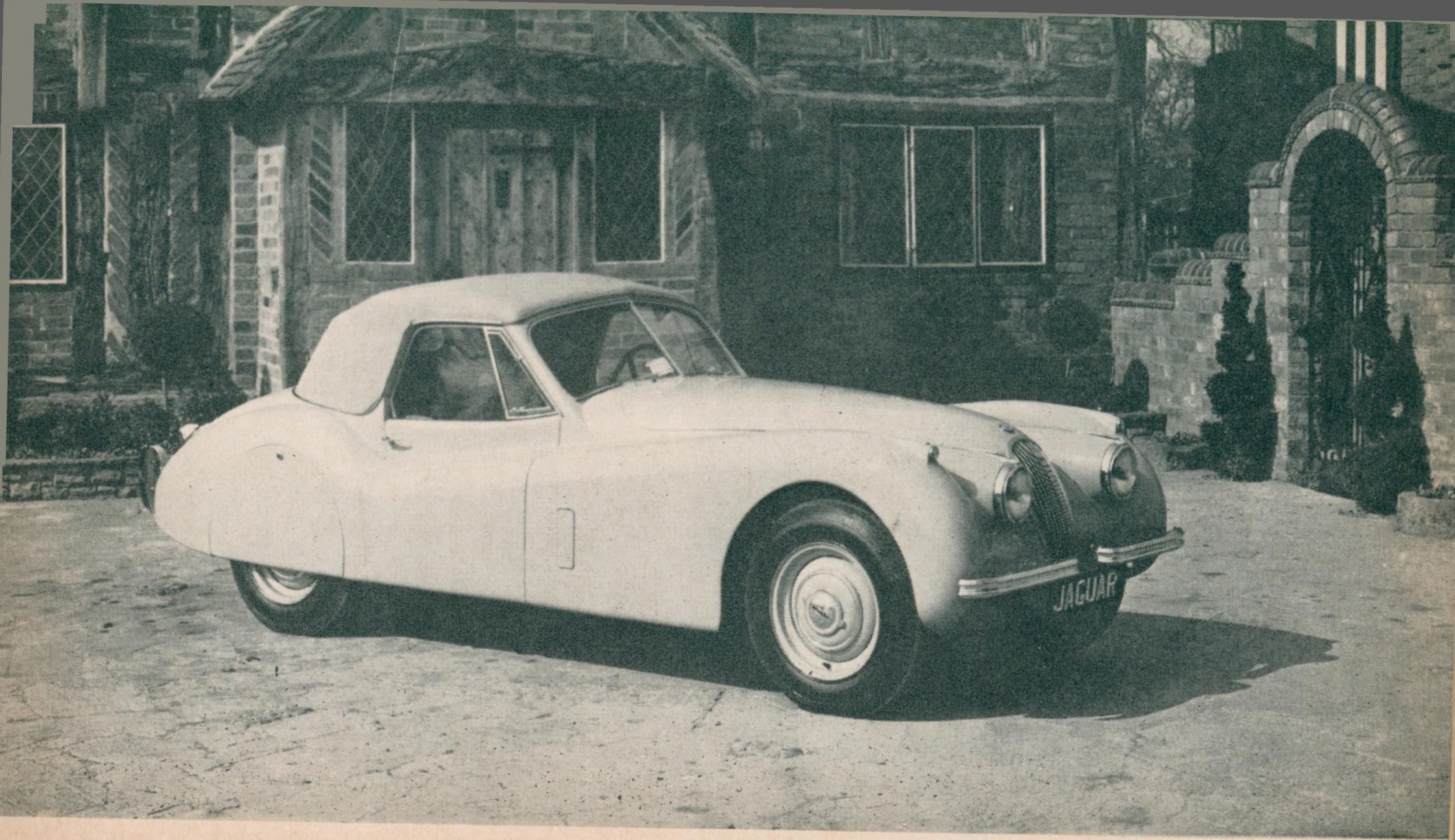
But when the price of a little under $4,000 was announced a wild sort of automotive hysteria arose. Yet, underlying this highly-charged enthusiasm came the oft-repeated doubting shake of the head.

"How can any car costing less than $4,000 be effective in competition?" To answer the many who asked this and the many who doubted the soundness of a completely new engine, Lyons had a stock model XK 120 taken to Jabbeke, Belgium, six months later, where—running on ordinary pump gasoline—it made a publicly observed and officially timed run of 132.6 mph. The orders came—far more of them than could be filled. The factory had not been tooled to produce the engine yet, and the first thousand cars had to be made by hand. In the U.S., the waiting period was two years.

Business was going so well and the engine had so faithfully lived up to the company's previous test results, that Lyons tooled up to produce the XK for his entire line of cars. In October, 1950, the Mark VII sedan was proudly announced with a mildly subdued XK powerhouse unit.

In its dimensions, the XK was very close to the pre-war push-rod engines. The stroke to bore ratio of 1.28 was only little less than the SS-100's 1.34. Displacement of 3442 c.c. was minutely under that of the earlier type. The stroke was, in fact, the same as that of the 2664 c.c. 1935 engine. Also similar was the seven main-bearing crankshaft.

But that was about the sum total of any similarities. In the top end, the XK engine was completely different. The in-line six design was destined to prove the most practical one ever produced. High-speed reliability in great part was due to the massive crankshaft with its seven unusually large main bearings. The crankshaft was mounted in a lightweight block with internal webbing to eliminate distortion or vibration. The shaft was completely balanced and the center main bearing absorbed end thrust. Duplex roller chains drove the overhead cams, which operated directly on the cam followers. Large inlet valves of silicon-chrome steel were paired with the small exhaust valves, which were made of austenitic steel. Valve seats were of high-expansion cast iron and, together with the tappet guides, were frozen before being pressed into place. This insured minimum loss of valve adjustment, any such adjustment being made at the factory or during valve grinds by using steel shims of varied thickness. Valves were set into the aluminum head at an angle of 70 degrees, allowing use of the hemispherical combustion chamber so important in a high effi-



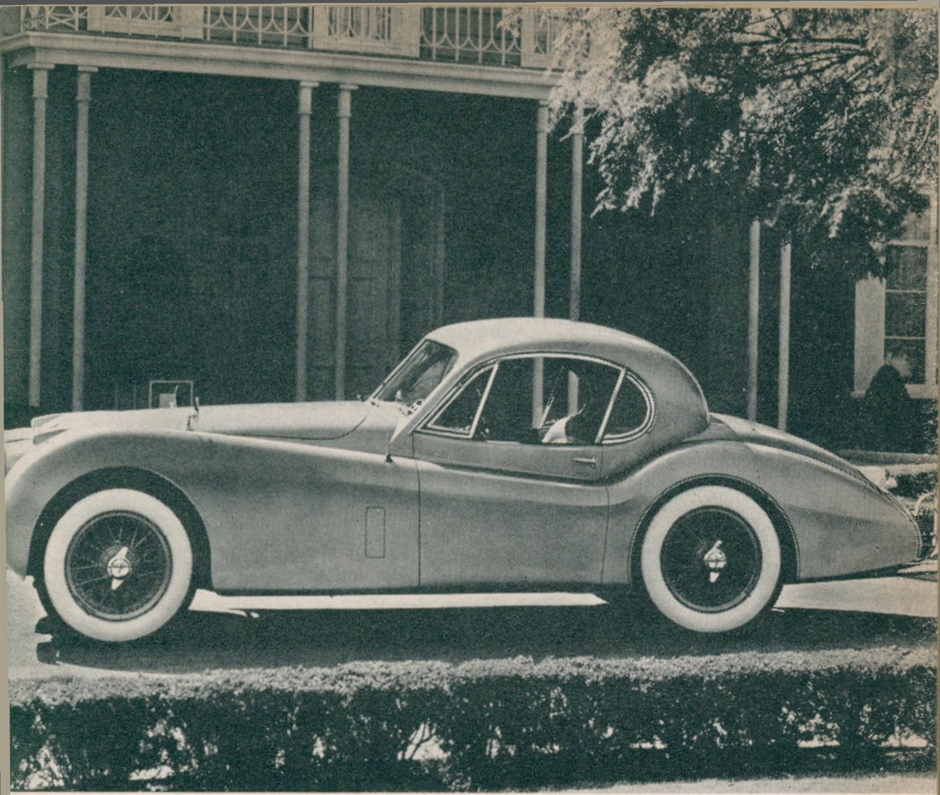
XK-120 Convertible.

ciency engine. Pistons were also of aluminum alloy, connecting rods of steel. The spark plugs were centrally located. The aluminum alloy head was scientifically ported with passages arranged to give maximum gas flow at a low valve lift. Lean mixtures could be used in the XK engine as the turbulence and chamber swirl were controlled by specially shaped inlet ports. The head was cooled by jets of water passing at high speed against the exhaust valve seat, thence to the spark plug, inlet valve and finally back to the radiator. Oil transfer design used large bore oilways and a high-volume, low-velocity pump to prevent the frothing associated with high speed oil movement—an important point in competition.

Factory testing also proved that the XK engine required less power to motor (using an outside power source to turn) than other engines of comparable size. Jaguar attributed this evidence of low friction to the result of careful engine design and attention to construction finish details. Peak piston power of the standard XK engine was high—around 3,750 rpm, (yet this did not appear to have any adverse effect on wear). Maximum power, full-load fuel consumption of 160 bhp six was between .50 and .53 pints of gasoline per bhp hour, affording clear evidence that both power and economy could be obtained by the kind of sound engine design so long exemplified in Jaguar products.

These various attributes made it possible to peak the stock engine at 5,400 rpm, a figure which is commonly associated with either very small engines or with pure competition machinery. Such high engine speed, particularly when achieved with a stroke of more than four inches, naturally brought up the troublesome question of piston speed. At the XK's horsepower peak, piston speed was unusually high, yet no mechanical failure has ever been recorded which could be attributed to this fact—surely proof enough for the most skeptical theorist.

On the other hand, the 3.54:1 top gear ratio of the stock roadster allowed a road speed of 82.8 mph at a piston speed of only 5,500 fpm. At the horsepower peak the calculated road speed was 112.5 mph. In racing, however, with the engine kept as close to peak as possible by extensive use of gears, the higher stresses and friction attributable to



Jaguar XK-120M Coupe. This modified sports version was equipped with dual exhaust system, 3/8-in. lift intake and exhaust camshafts, wire wheels, and other improvements.

the long-stroke design required some form of compensation. The competition record of the XK engine proves how effectively this was provided for. Bottom end trouble with XK engines is virtually unknown.

Tests to check high-pressure lubrication were carried out on a production built engine, the only preparation of which was 10 hours breaking-in. In this test the engine was held at 5,000 rpm for 24 hours on full load with five minutes at 5,250, 5,500, and 6,000 rpm every two hours. The oil temperature was maintained at 130 deg. C., and the engine, when stripped, showed no ill effects.

Although the general outline of the XK engine and its features has been covered in some detail, an analysis is now needed to answer the usual crop of questions starting with that disturbing "Why?"

"Why did they choose a hemispherical combustion chamber?"

"Why was the work of Messrs. Harry Weslake and Co. so important?"

"Why did they use steel connecting rods?"

"Why the choice of the twin overhead camshaft?"

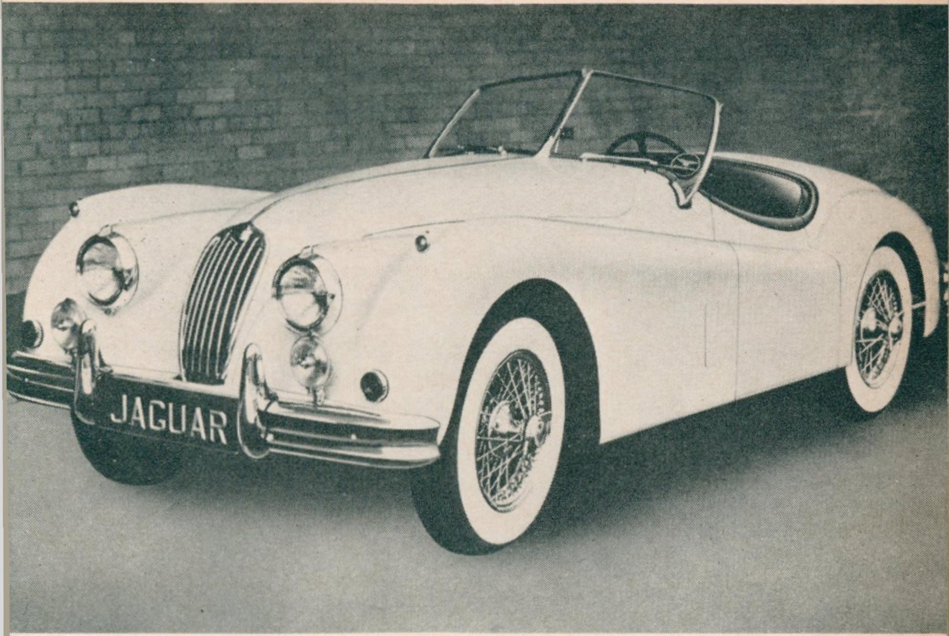
"Why was the present type of camshaft drive found superior?"

These questions are answered in the following chapter, in order to provide a clearer understanding of the work involved in designing the XK engine and also to give an appreciation of its reliability.

Meantime, although as the years passed the publicity releases and the newspaper and magazine writers continued splurging adjectives and dangling their participles about Jaguar design and performance, it was the mass market for which the production models were made that was giving the company its name, reputation and profit.

Starting with the two-year wait for the new XK 120 in 1948, the production of the eagerly sought after roadsters was soon in full sway and over 10,000 of them were sold in the United States alone, thereby immeasureably helping to fatten Britain's dwindling dollar reserves. After the fixed head coupé and the convertible were introduced, sales grew and grew. They were, with the exception of the much lower-priced MG's, the most popular sports cars in America. At almost every track around the country there was usually at least one XK 120 or XK 120M (Chapter 4) entered. These cars were at a premium for a long while and the average enthusiast considered them the last word in a dual purpose sports-racing car that he could almost afford. When the company announced its dramatic price cut of almost $700 on the XK 120 roadster and of $900 on the XK 120M roadster in September, 1953, the Jag came within the reach of an ever growing number of sports car enthusiasts.

The company had been keeping a close look on the market, and decided that, a period of six years having now elapsed since the first presentation of the XK 120 Super Sports roadster it would be wise



XK-140 Roadster. Styling changes included more practcial and solid bumpers.

to introduce a new model with more power but still retaining the familiar and popular XK lines. In October 1954, at the Earls Court automobile show in London, the XK 140 was introduced.

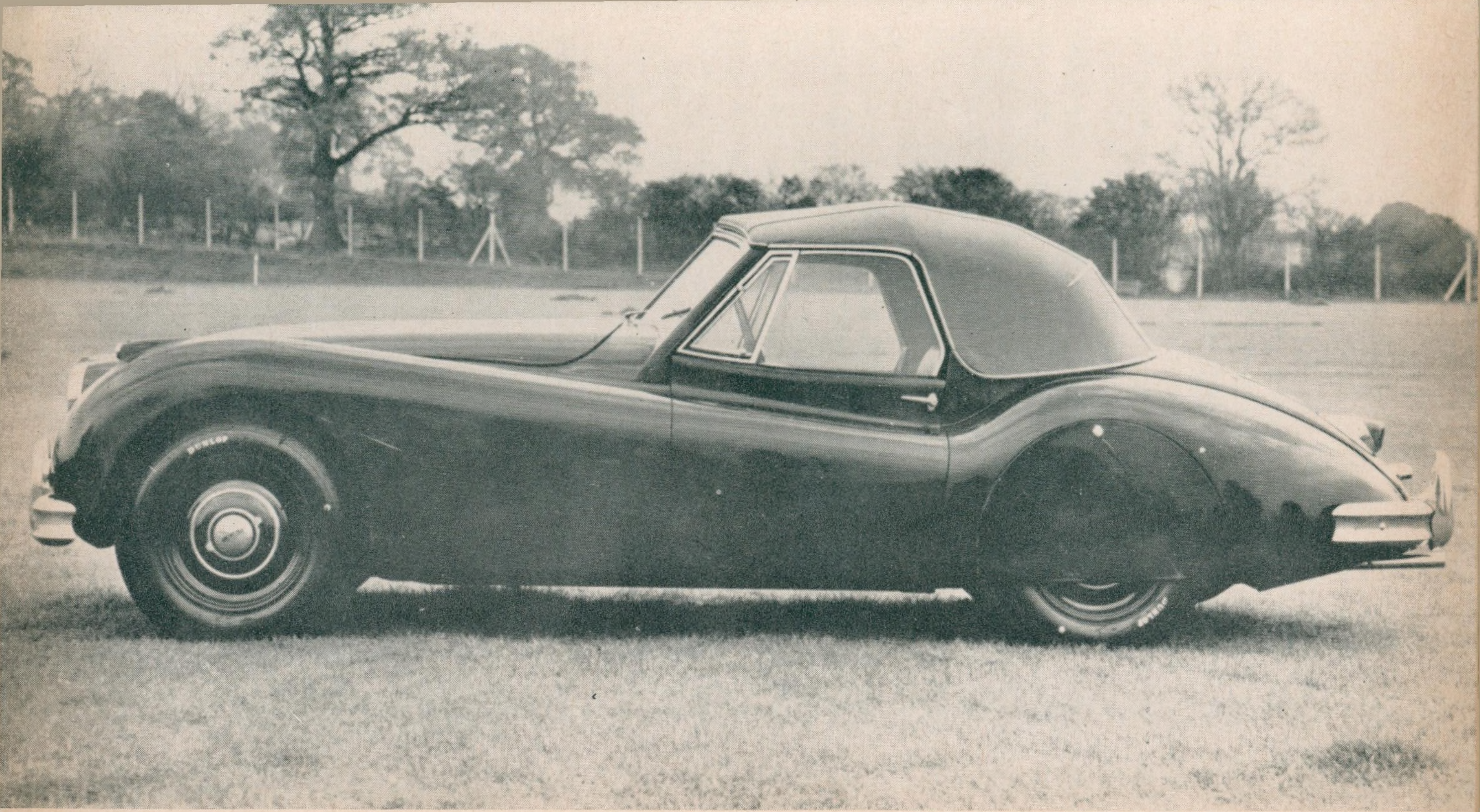
The most notable improvement of the XK 140 was in engine output—a higher, fatter torque curve and a boost of horsepower from 160 to 190. The increase in the power output, due in great part to its new high-lift cams, coupled with the introduction of rack and pinion steering, provided an excellent level of road performance, and yet kept the characteristics of smoothness, silence, tractability and road adhesion. A Lucas Oil Coil was standardized, which insured an adequate spark at high rpm. The axle ratio of 3.54 was retained, but the engine was moved five inches further forward than in the XK 120, a development, incidentally, that came directly from the race track. Similarly, the rack and pinion steering introduced on the XK 140 was of the type originally fitted to the C-Jags. In conjunction with the forward mounting of the engine, it gave improved road holding and steering qualities. A universally jointed steering column allowed for added leg room and a more comfortable seating position. These changes in design gave an increase of three inches in the seat adjustment (to seven inches), improved leg room under the dash, increased luggage space and better tool and spare tire storage. The bumpers were re-designed, probably in deference to America's driver cordiality; a new radiator grille was installed and jump seats were put in the rear compartment of the fixed head coupé and the convertible.

The XK 140-M came with a special high-speed crankshaft damper and center lock wire wheels. The front torsion bars were larger, affording a stiffer suspension. Next, the XK 140-MC was made available with a C-type cylinder head for the "M" engine. This head had modified porting which (in conjunction with a revised ignition curve and dual exhaust system, already fitted to the 140M) combined to produce the very high power output of 210 bhp at 5,700 rpm.

The orders that poured in for the new XK 140 lived up to Jaguar's fondest expectations. The good showing at Le Mans in 1954, the victory at Rheims and the repeat at Le Mans in 1955 did a great deal to help publicize the new XK 140. It rapidly became almost everyone's opinion that the XK 140 represented more performance per dollar than any other sports car in the world.

The latest in the line of sports car models is the newly introduced XK 150. The new body styling of the XK 150 was first displayed before the press and public on May 25, 1957, during the British Automobile Trials at the Lime Rock, Connecticut, race course. Even a casual glance suffices to bring to notice the major body styling changes. The new Jag seems to have been more "Americanized" than any of its predecessors, and it seems fairly evident that the car has been aimed at the export market, especially that of the United States.

The traditional two-piece flat glass windshield has been replaced



XK-140 Convertible.

with a curved one-piece. There has been a slight modification of the grille. Bumpers are stronger and are full wrap-around type. The room behind the driver has been increased and the two jump seats can take two children rather comfortably. The traditional dip of the car's side paneling has been done away with. Four inches have been added to the width of the body. The sides seem higher and the hood appears to have been lowered, giving the effect of one sweeping line from the rear forwards. There have also been changes in the rear; the trunk line has been re-contoured to complement the other styling innovations. The engine is the usual XK, but the torque has been further increased in the lower gears for better pickup, while the bhp is increased to 210 at 5,500 rpm. Maximum b.m.e.p. is 155 at 3,000 rpm; peak piston speed is 3830 rpm. The carburetors are now twin S.U. diaphragm type H.D. 6. Final drive ratio remains 3.54:1.

The greatest single improvement in the new XK 150 Jaguar is the introduction of four-wheel disc brakes as standard equipment on the export model. This brake system consists of four caliper-type disc brakes hydraulically controlled by means of a pedal-operated master cylinder and a vacuum servo unit. The front brakes have a larger piston area than the rear. Separate parking hand brakes mounted on the rear calipers are mechanically operated on the rear discs.

Each wheel brake unit comprises a hub-mounted disc rotating with the wheel and a braking unit rigidly attached to the suspension member. The brake unit consists of a caliper which straddles the disc and houses a pair of cylindrical brake pads and pad carriers. Cylinder blocks are bolted to the outer faces of the caliper and house the operating cylinder assemblies. Ball and socket type contacts are arranged between the pistons and the carrier plates, and flexible rubber dirt excluders seal the cylinders and pistons from foreign matter, moisture, etc. Each cylinder block also accommodates two retractor pin assemblies which function as turn springs and maintain a "brake off" working clearance of approximately 0.008-0.010 inches between the pads and the disc throughout the life of the pads. All the details related to the servicing of XK 150 disc brakes will be found in the appropriate chapter of this book.

3. CYLINDER HEADS AND ALL THAT

Few chroniclers of Jaguar's phenomenal postwar rise to a leading position among sports car manufacturers have given that brilliant engineer, Harry Weslake, anything like the credit he deserves for his vital development work on the XK 120 cylinder head. Owner of a small independent firm with a diminutive plant at Rye, Sussex, on Britain's channel coast, Weslake, more than anyone else connected with the "upstairs" design of the Jaguar power unit, was responsible for the superb breathey characteristics of this engine and the astonishing surplus of power contributed by its cylinder head. If he was not alone, this remarkable technician—who jokingly claims to make a living "by selling air"—was certainly a pillar in the beam of Jaguar engineers who toiled long and hard in their search for exactly the right type of cylinder head with optimum "breathing" qualities.

Necessarily, a variety of designs was studied and discarded before Jaguar hit on the right combination. Among them were the Lozenge or "T" head, the overhead inlet, side exhaust "F" head, the side-by-side valve and the hemispherical head. The following is an analysis of the "pros" and "cons" of these designs, as set forth by W. M. Heynes.

Lozenge or "T" Head

(i) Valve port flow is poor due to the proximity of the head wall on one side; also the hot exhaust valve in the path of maximum intake flow tends to head the incoming charge.

(ii) Turbulence is very poor. A slight effect can be produced by offsetting the heat to obtain 'squish', but this must be at the expense of flow.

(iii) Exhaust valve cooling is poor due to the proximity of the exhaust valve in the next cylinder on one side, and the inlet valve on the other, making it impossible to get water around the valve seat. In addition, cooling is uneven due to the gas flow being mainly at one side of the valve.

(iv) Burning is poor due to lack of turbulence and the flat shape of the chamber when valves of reasonable size are employed.

(v) Self-ignition is bad, due to the slow burning and proximity of the hot exhaust valve to the entering charge.

(vi) Machining requires a profile mill. To obtain an optimum shape often two form cutters have to be employed.

(vii) Service facility is good. The head can be removed for attention to the valves. Valve adjustment at the rocker is very accessible.

Overhead Inlet, Side Exhaust "F" Head

(i) Inlet valve flow is good. Exhaust is poor owing to pocketed position. With this type head however, high compression ratios are not possible, as the attenuated combustion chamber is so shallow that the exhaust valve opening is restricted.

(ii) Turbulence obtained by 'squish' can be controlled.

(iii) To achieve good exhaust valve cooling, it must be set away from the cylinder bore, but this adversely affects the combustion-chamber shape by attenuating its form.

(iv) Burning is good, if a compact combustion chamber is maintained and the plug suitably positioned.

(v) This type is usually free of self-ignition.

(vi) Machining is complicated by need for machining valve seats in both block and head. The head shape must be profile-milled if accurate compression ratios are to be maintained.

(vii) Servicing is probably more difficult than with any other type of modern engine. Top overhaul of the engine is extremely difficult unless the unit is removed from the car.

Side-by-side Valve or "L" head

(i) Inlet valve flow is fundamentally poor, except at very low speeds, due to the remote positioning of the inlet valve from the cylinder bore. It is impossible to employ fully the whole periphery of the valve. The size of the valves is severely restricted and adequate valve size cannot be obtained without lengthening the engine.

(ii) Turbulence can be controlled by the Ricardo principle.

(iii) Exhaust valve cooling is usually poor. This type has a greater fundamental tendency to valve seat burning than any other type.

(iv) Good combustion is obtained at low speeds by use of the Ricardo principle, but the hot exhaust valve by the inlet valve limits the compression ratio that can be used.
(v) There should be no self-ignition here where the Ricardo principle is adopted.
(vi) The cylinder head usually has a cast combustion chamber. The cylinder block, however, becomes a heavy and cumbersome unit requiring very fine foundry technique.
(vii) Servicing is simple if the engine is removed complete. Otherwise any servicing becomes practically an impossibility. Also, this type requires a greater need for attention to valves, exaggerating the disadvantage.

Hemispherical Head

(i) Valve throat flow is as good as can be obtained, owing to the blending surface of the hemisphere permitting the whole valve to be effective on both inlet and exhaust.
(ii) Turbulence is easily controlled by port shape to almost any extent.
(iii) A good flow of water to the seat is obtainable due to the open angle of the head surface with the valve inside the water jacket, providing good exhaust valve cooling.
(iv) Burning can be ideal when turbulence is correct and a central spark plug is used.
(v) Self-ignition is practically non-existent.
(vi) Service facility is good. Head can be removed complete for attention to valves, and there is freedom from interim valve adjustment.
(vii) The simplest of all types to machine. A single form-cutter is used on a fixed center, owing to the fully symmetrical shape.

The advantages of the hemispherical head over all other types are so many when carefully analyzed, that Heynes found it difficult to see why this type head wasn't more generally employed. It is interesting to note that the Chrysler Corporation in its research work before choosing the hemispherical head for its cars, also came to the conclusion that the six cylinder overhead camshaft type engine was the ideal, but because of cost considerations decided upon its second choice, the pushrod V-8.

In the manufacture of cylinder heads, the use of aluminum has been very widely advocated owing to its high rate of conduction. But this is not the only advantage which the material has. One of its main advantages is in the saving of weight. The weight of the bare cylinder head on the XK engine is 50 pounds. A similar head in cast iron would weigh about 120 pounds. This is obviously a serious consideration. Aluminum can also be machined with ease and in particular the head can be handled by machine shop operators without the need of lifting tackle. It does, however, require extra care in handling to avoid bruising.

The first experimental heads made by Jaguar were in a high silicon alloy. This was picked because it was felt that the low coefficient of expansion would be a valuable assistance in retaining the cast-iron valve seats, valve guides and so forth. The cost of this material, however, was quite high and it had several nasty tendencies when machined.

A switch was then made to DTD 424, a good quality commercial alloy of reasonable price which also had good machining characteristics, but with a rather higher coefficient of expansion than the silicon alloy. Six trial heads were manufactured and there was considerable doubt as to whether the valve seats would remain in position. No trouble was experienced, however, and a change was made to that material for production.

The valve seats were of high nickel austenitic cast iron (Brimol) which has an expansion rate about halfway between aluminum and cast iron. This type material was used throughout for both inlet and exhaust seats with every success.

In order to obtain high output per litre, it was necessary to see that the engine "breathed" properly. To handle this work, the firm of Messrs. Harry Weslake and Company was called in. The work they carried out on behalf of Jaguar was the vitally important designing of the valve ports. The basic principles of the curved port with a Venturi orifice were established by design and are subject to a patent, but the final shape of the actual port was obtained by development work on flow test initiated by Harry Weslake.

This work was carried out on full-scale models of either wood or aluminum, which were cleaned out or filled up in the port orifice until the maximum flow had been obtained. Experience showed that a larger valve or a higher lift did not invariably produce a higher flow.

Very small changes in port shape can produce quite a large difference in flow, so in order that nothing be lost in transferring to paper and back, accurate male cores were taken from the model and supplied to the pattern maker from which his core boxes were made. The latest cast ports thus made produce similar power to the master port without fretting.

This method of arriving at the port shape by flowing, instead of by repeated bench tests, allowed for a great economy in development time, and although a certain standard of perfection can be produced by design, a well designed head will still yield a further 10 per cent in b.h.p. at the same peak revolutions by the intelligent use of this technique.

There were several reasons for reverting to the use of steel rod on the Jaguar engine, but probably the main ones had to do with oil pressure control. A factor not generally appreciated is the adverse effect resulting from the use of aluminum alloy rods. Owing to the high coefficient of expansion the increase of diameter in the big-end eye when hot has the effect of practically doubling the clearance and the loss from this point. This condition does not occur when steel rods are used.

Once the hemispherical combustion chamber of the XK cylinder head had been decided upon, there was still the decision as to how the valves should be operated. There are so many possible ways of doing this that over a dozen layouts were made before the pros and cons of each could be properly assessed. These layouts included twin overhead camshaft with cams operating directly onto the tappets, twin high camshafts in the block with short push rods, a single central camshaft with rockers, a single camshaft in the block with vertical and cross push rods, and diagonally placed push rods.

In the end the simplest system was the best. The twin overhead camshaft, with cams operating directly onto the tappets, had many virtues over any other system—particularly in view of the fact that the engine was expected to operate continuously at a higher speed than had ever been used before on a production automobile. The system chosen had some more obvious advantages.

The low reciprocating weight of the valve parts permits the valve spring strength to be approximately half of that required for a full length push rod and rocker operation. This means that one of the chief causes of valve seat wear and valve breakage is eliminated, as are also the very high tappet loads which are obtained with a block-situated camshaft. A comparison of moving parts in the O.H.C. and push-rod engines shows the fitted load for the valve springs on the O.H.C. to be 102 pounds, designed for 6,000 rpm, whereas for the push-rod engine on a similar basis 217 pounds would be required. The total weight for each is 7.8 and 18.4 ounces respectively.

A second point is the absence of wearing surfaces between the tappet and the valve. As there are no sliding or moving surfaces during the operation of the valves there is no possibility of wear taking place, except due to the small amount of movement when the valve rotates, which only seems to polish the surface of the mating part. This alone made the adoption of the twin overhead camshaft system worthwhile, as it made it possible to eliminate any servicing adjustments, which is the most annoying feature of most push-rod operated engines.

A still further point is the protection the inverted tappet gives against excessive oil consumption through the guides, which, as may be judged by the remedies employed by most push-rod engines, is a common complaint.

Initial adjustment of the valve clearances does call for rather more skill than the use of the normal screw adjuster, but once carried out it is a precision job and the clearances stay put. The whole operation can be carried out with the head on the bench.

The method of adjustment is by means of hardened steel disks of varying thicknesses inserted between valve and tappet. To carry out the operation it is necessary to first check the existing clearances with the camshaft in position, record each tappet in turn, the amount above or below the desired clearance, remove the camshaft, and then the tappets one at a time, measure the thickness and replace by a new disk, thicker or thinner as required, and finally re-assemble the camshaft in the head.

Having decided on the use of twin overhead camshafts, various combinations of chain or chain and gear drives were contemplated. The scheme used on the first experimental engines very closely resembled the scheme which is now used successfully in production.

After the first engine had been made, discussions with the chain manufacturers led to the design of a simplified layout. This scheme used a single chain and one adjustable and one non-adjustable sprocket, and a sprocket drive for the oil pump and distributor.

Experimental engines were made embodying this type of drive, and, while it was in every way satisfactory from an operational and wear point of view, it was subject to a peculiar high-pitched whine, barely audible when standing close but most noticeable when standing a short distance away. A considerable amount of development time was spent in trying to overcome this feature. Experiments included dampers at almost every point on the chain, flexibly mounted jockey sprockets, and one application with the jockey sprocket mounted on a rubber center; but although the chain continued to operate quite well under all these conditions, the noise still persisted, and the design had to be abandoned as a solution could not be found. Thus a return was made to the original design in a slightly modified form.

The design of the camshaft sprockets was a noteworthy feature. They were adjustible to a very fine degree. This enabled accurate setting of the initial timing to be made, which is so essential in high efficiency engines. It also takes care of any minor manufacturing discrepancies.

Serrations were cut internally in the sprocket, which, used with the twenty-two chain teeth, gave a vernier adjustment for the timing. Two set pins held the assembly to the shaft, and when it was desired to remove the cylinder head, the sprocket was removed complete and held on its own dummy spindle in a carrier on the front plate with the chain remaining in place. The camshafts then could be removed or the cylinder head removed without losing the timing. When the head was returned to the engine all that was necessary was the re-insertion of the two screws in both camshaft flanges in order to restore the original timing.

As soon as they were delivered, the private owners of the new XK 120s rushed them into battle with wheels flashing and bonnets snorting. The new design was a winner. The XK 120 could do 120 mph as its name implied. This was then more than enough speed. The torsion bar independent front suspension with semi-elliptics to the rear gave the roadster good stability at high competition speeds, while at the same time it rode comparatively smoothly and was docile and maneuverable in traffic. It was an out-and-out smash hit. Only the MG can claim more credit for developing American interest in sports cars.

It wasn't only in America that Jag drivers smiled as the checkered flag came down. Those who could obtain the XK 120 in England and on the continent were having a similar success. In 1949 at the Tourist Trophy race, a stocky determined 21-year-old entered into his first long distance race in a borrowed XK 120. Through a howling gale that left the streets of Dundrod glistening and slippery, Stirling Moss rode his first big car race and won his major victory. It was an omen for both Moss, who developed into one of the world's greatest racing drivers, and the Jag, which already was one of the world's best racing cars. They teamed up many times after that memorable date and have brought back to England more prizes and awards than any other racing car in British automobile history.

To further prove the reliability of the new engine, the Jag ran for 24 hours at Montlhery, France in 1950 at an average speed of 107.46 mph. Yet, despite this showing and despite its numerous racing successes, disquieting rumors kept reaching Lyons' ears to the effect that the Jag just "couldn't take it." No one knew where the stories started, but by 1952 they had become circulated widely throughout racing circles.

To answer all critics and still malicious gossip once and for all, Lyons and Heynes sent a production model Jag XK 120 Coupé back to the Montlhery track in France. Accompanying the car were four drivers, Leslie Johnson, leader of the team, Stirling Moss, J.E.G. Fairman and H. L. Hadley. Their instructions were to drive the XK 120 day and night, all out, for a week, stopping only for fuel, tires and change of drivers.

On the afternoon of Tuesday, August 5th, 1952, the production model Jaguar XK 120 began circling the Montlhery track. For seven days and seven nights it kept up the grueling run. When it was finally pulled over to the curb, it had been driven non-stop for 168 hours at an average speed of 100.31 mph! In one week it concentrated two years of normal driving at super-high speeds, covering 16,851.73 miles. On its run it broke these records:

72 hrs. at 105.55 mph (World and Class)
10,000 kms. at 107.31 mph (Class)
96 hours at 101.17 mph (World and Class)
15,000 kms. at 101.95 mph (World and Class)
10,000 miles at 100.65 mph (World and Class)

The critics were stilled.

But to prove beyond anyone's wildest doubt that the XK 120 had the stamina and durability to match its record speed, Lyons agreed to let the engine of this car be taken down, which it was, by the Shell Oil people, who examined it and made a summary report for all to marvel at:

Engine Make:	Jaguar
Engine Type:	XK 120
Mileage:	Miles since new: 18,078
History:	Removed for examination from the XK 120 coupé which completed one week's operation at 100 m.p.h., covering 16,800 miles over the run.
Cylinder head:	Very slight deposit—below normal for mileage covered.
Valves:	Inlet—very good condition. Exhaust—Very good—no signs of burning.

Tappets:	Very good condition. No signs of pitting or wear.
Camshaft:	Excellent condition.
Cylinder bores:	Average wear at top of bore: under .003″ on thrust face. Average wear at centre of bore: under .002″ on thrust face.
Pistons:	Excellent condition.
Piston rings:	Very good condition, especially stepped gas rings and oil control rings. Slots completely free from deposits.
Connecting rods:	Clean, with very slight lacquer deposit at top end.
Small end bushes:	Excellent condition. Average wear: .0002″ on diameter.
Gudgeon (wrist) pins:	No detectable wear
Big end (rod) bearings:	Good condition and suitable for considerable further mileage, but evidence of slight pitting due to carbon or similar material being hammered into alloy surface.
Main bearings:	Excellent condition except slight score on one bearing due to foreign matter.
Crankshaft:	No measureable wear (within production tolerance)
Sump:	Clean and free from sludge.
Rocker covers:	Clean and free from sludge.
Timing case:	Clean and free from sludge.
General Comments:	The general condition of the engine was excellent and would have been considered so for the above mileage under normal operation. The slight pitting of the big end bearings mentioned above is probably explained by the requirements of the record run preventing regular servicing of the oil filter in accordance with the Manufacturer's recommendations.

The technical report on the strip-down, stated:

"The general condition of the engine was excellent and had the engine not been dismantled there was no apparent reason why it should not have given satisfactory service for many thousands of miles of normal hard driving. Crankshaft wear was so low that, inspite of the car having covered nearly 17,000 miles on the record run, plus just under two thousand previously, the crankshaft was still within production tolerances *and would have been passed by the inspection department for installation in a new car.*

"Bore wear was not abnormal, showing a maximum of 3-3½ thousandths at the top of the bores for a total mileage of around 18,708. All the pistons were in good condition apart from slight erosions on the top of one, whilst gas and scraper rings were bedded perfectly in the bore and the absence of carbon deposit was particularly noticeable, even on the tabs between the slots.

"The sump was free from sludge, as were also the camshaft covers.

"The cylinder head was virtually free from deposit, and the valves and seats, both inlet and exhaust, were in very satisfactory condition. All valves were seating perfectly, although slight pitting and blackening of the surface of the exhaust valve seats had occurred. The standard type plugs which had run the total distance, plus some running before the test started, were in astonishingly good condition showing no appreciable insulator deposit and, to the eye, no appreciable gap erosion.

"The rear axle cover plate was removed and the crown wheel and differential gears examined. The axle was in perfect condition as far as could be seen, both faces of the crown wheel having an excellent finish and the differential gears still showing some of the original machining marks."

4. THE "C" TYPE AND LE MANS

As the Jaguars continued their surprising successes in competition against much higher priced and often professionally driven competitors, queries began to come into the home office from owners round the world. They wanted to soup up the Jags and they asked how to do it. In response to this mounting pressure, the company issued a special booklet on high-speed tuning and in addition offered pistons giving compression ratios of 7:1, 8:1 and 9:1; high-lift cams; a lightweight flywheel; dual exhaust system; larger diameter stiffer front torsion bars; stiffer rear leaf springs; racing wire wheels; and a special vibration damper.

In 1951, the company finally offered the Modified XK 120, fitted with all the above special speed equipment and producing 190 bhp at 5,200 rpm. The torque was increased to 203 ft.-lbs. at 3,500 rpm. The cost of all this was a very reasonable $395, and for it the owner received quite a power boost. In a test of the modified engine in the coupé body, a creditable improvement through the entire speed range was evidenced. It went from a standing start to 80 mph in just 14.9 seconds, an exceptional performance for a mass produced inexpensive car.

The rated top speed of the XK 120M was 123.3 mph, which curiously was almost identical with *The Motor's* test made in 1950 with one of the earliest XK's. *The Motor's* clocked average of 124.6 mph, however, was made with a 3.64:1 axle ratio, while the coupé managed just one mph less with a 3.77:1 axle ratio.

A truly fast car like the XK 120M will always find staunch supporters, but the very great appeal of the speedster was due to the fact that the engine was the epitome of flexibility and just as much at home on the highway as on the race track. It accelerated smoothly from 15 to 120 mph in top gear; third was an entirely practical city cruising gear, and under normal driving conditions there need be no reason to use more than two of the four speeds. The XK 120 could normally be started in second, and from there it was often thrown right into high by the lazy driver. For highway passing, third accelerated from 60-80 mph in six seconds. Acceleration in fourth gear was constant, just under four seconds for each 10 mph increment from 15 to 80 mph, at which point torque peak was reached. Cruising speed? Almost anything you desired. The XK 120M did 77.7 mph in fourth gear with a piston speed of 2,500 fpm. At 93 mph in fourth, piston speed was only 3,000 fpm. The latter figure could be used as a conservative cruising speed.

The stiffer suspension provided for in the M let it corner quite sharply with open throttle in second gear without skidding, except if one became careless. The rear end carried a slight bit more of the weight distribution which wasn't enough to make the car's tail wag, but was sufficient to break the rear end loose before beginning a four-wheel drift. Even the novice driver had no trouble here if he kept his wits about him and was careful, especially on wet roads. The braking power now was sufficient and much improved over the earlier models where it tended to fade. The stiffer springing made road shocks more noticeable than in American cars at speeds up to 25 mph, but once above that figure the stiffness afforded a far more comfortable ride than a soft spongy car could, and it was even possible to write notes legibly at cruising speeds.

The XK 120 models and the new Mark VII were bringing a happy prosperity to Jaguar. They had grown like the proverbial Topsy and once again found themselves in need of more space. Although the factory now occupied 600,000 square feet, it just wasn't sufficient and as the walls seemed to get narrower, Lyons could see that it would be a matter of time before it would interfere with the production efficiency of his force of 3,000 workers. Negotiations were begun with the British government to acquire a factory in Coventry which had been a war time arsenal. When the deal was closed in mid-1951 Lyons found himself the owner of a million square feet of space to the northwest of the city. Starting by departments, the equipment was on its way to the new plant by late in the year. Moving one department at a time, the changeover was completed in December 1952.

Times had changed greatly since first Bill Lyons had looked upon automobile racing as a ruinous expenditure and was known for his: "Let the customer do it." When the XK 120 first appeared in 1948, his attitude had not seemed to waver, at least to outside observers. And the Jaguar cars, so hot under the bonnet and so true on the turns had not been having the best of it at the hands of amateur drivers. They did win their share, considering many problems, but racing enthusiasts are a critical tribe ever eager for more performance.

Sports car racing was catching on big. The press was giving it more and more coverage; more and more people also flocked about the tracks and along the winding roads of Europe's treacherous road races. In the U.S. sports car clubs were springing up everywhere and racing soon began to mushroom in popularity. Lyons, his intuition to the windward, was keenly aware of this awakening interest in racing and took note with some concern of Jaguar's failures to win.

Finally, Lyons and a party of Jag officials decided to attend the 1950 Le Mans Grand Prix of Endurance to see for themselves how matters stood. There, amidst the thrilling cheers of thousands of spectators, the finest racing machinery in Europe revved around and around. But the amateur driven Jags didn't keep it up for very long, and sooner than it is pleasant to recall, one by one the XK 120's dropped out.

Heynes likes racing. He believes it to be the best possible testing ground for new ideas and developments. As he watched the progress of the 1950 Le Mans race, he declared that he could build an engine that would win the race in 1951. He knew what his engine could do.

"But it can only win," he stated, "if we have our own pit crew and some professional drivers."

The decision to go ahead was made while everyone was still in France. In 1951 the Jaguar Company unrolled a new and untested car at Le Mans, bearing the designation XK 120C.

The trade and public both saw the XK 120C for the first time during practice runs for the 1951 race. Up until then, the car had been kept in strictest secrecy and all testing had been done by the factory in private runs. There were many new cars at Le Mans and no one paid more than a cursory glance of passing observation at the new entry. Why should they? No one expected anything of a new, untried design in the grueling 24 hour Grand Prix of Endurance. It had been a long time since any of them could remember a brand new car, so full of unshaken bugs, having finished on its first time out. No one could remember a brand new car ever winning, especially when it was the first all-out competition car that the factory had ever built. The XK 120C entered the race an unknown quantity and certainly the darkest of dark horses.

The flag went down and the race was under way. Moss at once jumped into second place in his Jag, with Johnson coming up fifth in another of the new green cars. Moss kept a heavy foot down and broke into the lead on the fourth lap, passing a highly imposing modified 4½ Litre Grand Prix Talbot. He asked for more speed and the C-Jag gave it. His lead increased steadily and records were broken on laps 18, 20 and 31, the last at 105.85 mph. After slightly more than four hours, Johnson had to retire with no oil pressure and the experts nodded knowingly. Walker moved up to second place behind Moss in the third team car and at the eight hour point the Jags were running 1-2. Then Moss lost his oil pressure too, on the 92nd lap, with a rod through the side of his crankcase. Walker was then in first place with 18 long hours to go and followed by a hoard of avenging angels in Ferraris, Lancias, Talbots, Cunninghams, Aston-Martins and others. The experts just kept nodding their heads and figured out who would take over when he dropped out.

As the night wore on, Walker increased his lead, and one by one his competitors dropped into their pits to wait 365 days for another go at the race. Gonzales dropped out in a Talbot with a blown head gasket. Fitch in his Cunningham called it a day with valve trouble. As the clock read 20 hours, the C-Jag was leading the pack by 10 laps. Walker, intent upon just finishing, eased the pace a bit and at the 23 hour mark had broken the previous distance record. When the slide rules were put away after the finish of the race, he had covered 2,244 miles at an average speed of 93.50 mph and was 77.67 miles ahead of the second place finisher. In addition he was holder of the new 24-hour speed record, fastest lap record and greatest distance record. For the first time in 16 years an English car had won the greatest sports car race of them all.

The changes made to the XK 120 engine for racing were not of a major character or even beyond the capabilities of a private owner experienced in these matters. Any of the special material used for racing was duplicated and made available not only to the owners of XK 120C's where it was standard equipment, but also to owners of the XK 120, and in certain respects to Mark VII owners as well. The engine was the regular XK, factory tuned and with special equipment, including the features incorporated into the XK 120M. Its tuning modifications included an 8:1 or 9:1 compression ratio according to the fuel to be used. Heynes stated that for all competition work on cars run by the company the standard compression ratio of 8:1 was used with the exception of 1951 when it was raised to 8.5:1. He is opposed to using the maximum possible compression ratio for sports car racing, as experience has shown a very wide variation in the grade of fuel supplied for these events and light detonation from an unmatching fuel can easily cause piston crown burning.

Different high-compression domed pistons were used, depending on the compression ratio. The ignition was advanced and a special distributor head fitted. The carburetor needles were special, and the spark plugs colder. A lighter flywheel was used, and also a special high-speed crankshaft damper. A dual exhaust system was an important feature. The clutch had a special assembly, with a solid center and linings riveted and cemented to the plate, to deal with racing starts. Oversize SU carburetors breathed through a balance box. Much of the work of increasing the power output of the engine was again carried out in conjunction with Harry Weslake.

The main object of these modifications was to obtain better b.m.e.p. (a function of valve efficiency) at the higher speeds, and also, if possible, increase the safe speed range, even at the expense of the bottom end, but this fortunately was not the case. The various parts on which work was done are set out below:

(a) Cylinder Head

The same casting was employed, but extra fettling of the ports was carried out, and the inlet valve guide cut back level with the port. The inlet valve was increased in diameter by 1/8 inch to allow a larger radius where the port joined the seat and permit a smoother entry. However, the internal diameter of the valve port remained unchanged. The exhaust valve diameter and port diameter were increased from 1 7/10 to 1½ inches and from 1¼ to 1⅜ inches respectively. The exhaust valve flow was improved materially by this change, but it was interesting to note that, until the improved inlet port flow was obtained, this change gave nothing either on the bench or the road and likewise, the improvement gained by the inlet port change was only partial until the exhaust was also modified.

(b) Valve Springs

The springs on the valves of the standard engine gave an adequate margin up to 5,500 rpm and had been trouble-free in use. For racing the same spring with a slightly increased free length was used, which permitted operation without bounce up to 6,500 rpm.

(c) Camshafts

In order to retain the bottom end of the power curve the standard timing was employed. The lift, however, was increased from 5/16 to ⅜ inch by eliminating the dwell and raising the top radius. This happened to be possible with almost the same flank radius.

(d) Pistons

Solid skirt pistons with racing clearances (0.006-in. on the skirt) were used. They were fitted with pressure-backed rings, which provided a cure for broken top rings and blow-by when operating continuously at speeds in excess of 5,000 rpm.

(e) Carburetors

Dual two-inch diameter S.U. carburetors replaced the standard 1¾ inch diameter type normally fitted. Instead of the air silencers a stabilizing box was fitted over the mouths of the carburetors into which cold air was ducted from in front of the radiator. The box had an open end at the rear so that no ram effect was obtained but merely a column of cold air free from unwanted eddies. The induction pipe was a production part, but the entry was opened up to match the carburetor size and the balance size was increased from ⅞ inch to 1¼ inches.

(f) Bearings

More as a precautionary measure than because of any actual experience of failure, the bearing material was changed from Babbit to Indium-coated lead bronze, both for main bearings and for big ends. The crankshaft was identical with the standard shaft, the extra clearance necessary for the lead bronze being allowed for on the bearing thickness.

(g) Oil Pump and Sump

Trouble was experienced due to the oil building up at one or the other end of the crankcase during acceleration or braking. During maximum acceleration in second, the surface of the oil took on an angle of 20 degrees, and in first of 30 degrees, to the horizontal. The oil in the sump had to be trapped so that the pump suction was not uncovered or the rear bearing unduly flooded. The sump also had to be slightly deepened and widened and the main chamber on either end sealed up so that under those conditions the oil in there was trapped. The flooding of the rear bearing was important not only because of power loss which occurred due to mechanical reasons and the danger of excess oil getting by the pistons, but also due to the serious loss of oil that could occur through the rear bearing under these conditions.

When designing the XK 120C, it was decided that, if enthusiasts really wanted to try their hand at rough and tumble catch-as-catch-can sports car races, the thing to do was to give them a lightened new version of the XK 120 made for that job and that job only, which meant a chassis that could take speeds of 150 mph or more and could be handled at these speeds.

The type C Jag was a stark competition car. For the first time comfort was sacrificed on the altar of high performance. Its seating capacity was limited, though it could carry a passenger. He, however, sat on the tool kit, cushioned by very thin padding indeed, and rode higher up than the driver and directly in the slipstream, which made it somewhat disconcerting to him as the car was not provided with a top or regular windshield. There was only one door, on the driver's side, and everything was stripped wherever possible for the purpose of reducing weight. A 40-gallon gas tank was carried in place of the luggage compartment.

In laying out the design of the chassis, primary emphasis was put on improving the power-to-weight ratio. This was done by reducing the weight of the car and stepping up the power output of the engine, in the interests of acceleration and high speed. To make the most of this advantage in racing and competition, the cornering ability had to be improved which meant a stiff frame construction that was as light as possible, a quicker more positive steering action and a better controlled suspension.

Whenever a car is built for very high speeds, much attention must be given to the construction of the chassis. If it is not rigid enough, it will be difficult for the driver to have any real precision control to insure that in taking curves and corners he still remains in the race.

Maximum acceleration and braking also puts a severe strain on the frame and if it has any soft spots they can well prove the car's undoing. In the Type C frame this rigidity was accomplished. That it was done without at the same time being too heavy makes it a very interesting study in design. It was, quite naturally, different from the more orthodox XK models.

When designing a competition or racing car, so long as the driver has the agility to leap hurriedly in, and compose himself for action in the briefest time, that is enough. There was formerly need for only one door, and that only a shallow affair. This quite simple aspect had a very definite bearing on the design of the frame as a whole, because it allowed room for a structure of increased vertical height just at a point where rigidity was much needed, but is apt to be lacking, as on most open two-seater cars with two doors.

The "C's" center section framework was triangulated for strength in three directions; laterally, horizontally and longitudinally. Projecting forward from the center section there was on each a triangulated girder of steel tubing, forming a sort of horizontal pyramid. The outer side of each pyramid was also diagonally braced in the vertical plane. The apexes of the two pyramids were joined by the front cross-member structure. This structure was further braced by an aft cross tube at the top and diagonal foot bracings. Top and bottom of the front cross-member structure were brackets providing anchorage for the lateral links of the front suspension system, and the lower bracket on each side contained the front end of the longitudinal torsion bar, the tail of which was adjustably located in a bracket on the lower cross tube of the main center section of the frame. This construction provided for rigidity between the front cross-member component and the center section in every direction. The engine was mounted in the space between these pyramids. From the main section, the lower longitudinal tubes of the forward part continued rearward to a tubular cross-member, in which the torsion bars of the rear suspension were housed. Triangulated tubes ran down from the top of the center section to meet this cross-member, and were further braced with diagonals. Running diagonally upwards and rearwards on each side were box section members, joined at the top by a cross tube. A steel bulkhead filled the space between. It was made with a large slot for the tail of the propeller shaft and nose piece of the final drive case. From the front cross-member to the center of the back cross-member there were channel section runners with numerous perforations for lightness. These also were diagonally braced and carried the steel flooring.

The "C" type Jaguar frame needs a little explanation because of its unusual shape. The driver had his bucket seat in the part behind the center section, with its back adjacent to the slotted bulkhead. X-shaped members on each side occupied the space where the doors of an ordinary car would be, so at this point the frame retained its strength and was fully triangulated right up to the point where the back axle was attached. This brings us up to the very interesting design of the rear suspension.

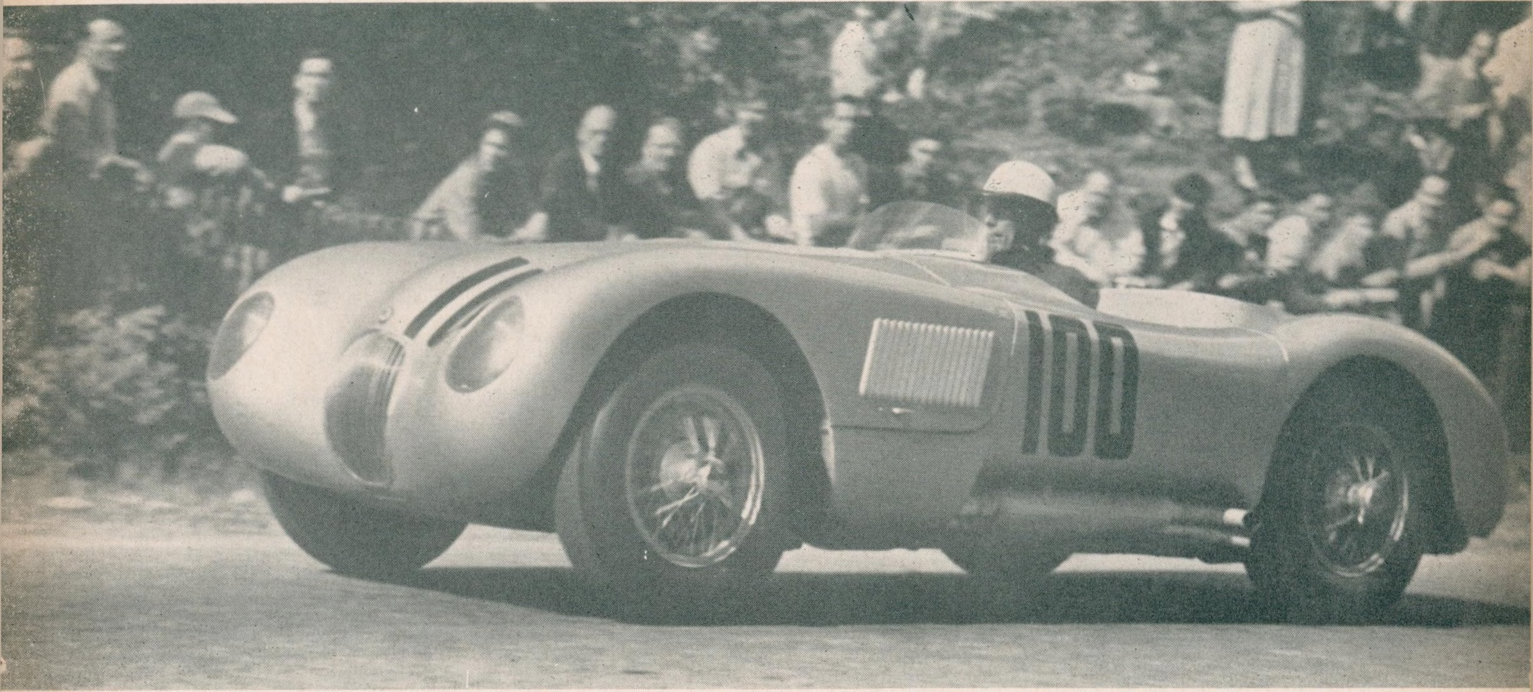
In the rear, the semi-elliptic springs were replaced by a single center mounted torsion bar. The rear axle was of tubular type with an offset hypoid bevel final drive and an open propeller shaft with Hardy Spicer needle roller-bearing universal joints. Below each end of the axle casing was a downwardly depending bracket, at the foot of which was a link running forwards to a fulcrum anchorage at the back of the frame. These anchorages were attached to the ends of the rear cross tube of the frame as described. The fulcrum of each link was splined to the outer end of a torsion bar spring, concealed in the cross member and anchored in the center of it. This central mounting had the effect of two short torsion bars while at the same time economically solving the problem of transverse location. The foot of a telescopic hydraulic damper was attached towards the end of each link, and the head of the damper was hinged to the end of the upper lateral tube at the back of the frame structure. This system was further refined by a single torque-reaction damper which was hinged above the axle near the right rear wheel, with its fulcrum parallel to the axle and its apex hinged to the back of the frame. The purpose of mounting it to one side was to control the tendency of the wheel to lift under severe acceleration as well as to check the twisting effects in the axle housing due to acceleration and braking. The entire rear suspension (patented) was said to provide wheel adhesion "similar to the de Dion axle" and was largely responsible for the excellent road-holding qualities of the car.

The independent front suspension was similar to that of the XK 120 and consisted of lateral wishbones and longitudinal torsion bar springs, controlled by large size (two-inch diameter) Newton telescopic hydraulic dampers. The outer ends of the wishbones had spherical caskets which embraced ball heads at the top and bottom of the stub axle "fork", so that this fork became the steering swivel as well as forming the strut between the ends of the wishbones. The two independent systems were cross-coupled by a torsion anti-sway bar. Another material difference was the use of rack and pinion steering gear. The purpose was to provide a light and direct steering, quick in action. The steering wheel had telescopic adjustment, and the column a universal joint at the foot.

To summarize, the greatest modifications were made in the chassis and suspension system. The chassis framework was of very light tubular steel triangulated for strength. The rear suspension was a unique arrangement composed of a transverse torsion bar to which the rear axle was attached by trailing links and hydraulic telescopic dampers. The front suspension was similar to that of the stock XK 120, wishbones and individual torsion bars. The streamlined body was sectional so that the hood hinged forward of the front axle and lifted up, while the rear also was quickly removable for accessibility.

1951 was a good year for the C-Jag. It entered and won race after race (see table), but probably the most noteworthy achievement of all was that this was the first competition car Jaguar had ever built and the first time the company had ever backed its cars on the racing circuit.

But 1952 was another year. Out of Germany the new Mercedes 300SL came a-roaring, and in its wake several times left Jags, Ferraris, Talbots and the rest, as an omen of even greater things to come. Before Le Mans, that year, the Jaguar people worked desperately to add a few mph to their competition cars, but due to severe



John Fitch in the winning C-Type Jaguar during the Senecca Cup at Watkin's Glen in 1952.

pressure of time one important factor received insufficient attention. This was the water pump, which proved the undoing of the C-types in the French classic that year. To ensure adequate circulation, the pump had to be driven at 90 per cent of engine speed; with the revs. soaring up to the 6,000 mark, the impeller of the pump rotated at 5,400 rpm. At this speed, a phenomenon known as "cavitation" developed, causing a steam pocket to form on the suction side of the pump, at the eye of the impeller, which seriously disturbed flow—at times stopping it altogether. It was overheating from this failure that primarily forced the retirement of the Jaguars, and not (as was commonly thought) the somewhat peculiar shape of the air intake. Extensive research finally led to a new design of impeller which cured the trouble.

With a few shelves already broken under the weight of their trophies, Mercedes announced at the end of the 1952 racing season that they were withdrawing from competition for the time being to apply lessons learned to the design of their forthcoming Grand Prix machines.

This decision did not sit well with the other manufacturers. The Ferrari Company (which did not appear to believe the reason given for the Mercedes withdrawal after only one season's racing) threw a challenge to the wind, offering to race the Germans anywhere at any time. But the wind never did get an answering echo from the other side of the Alps. The other companies built new cars and improved old ones, just waiting for another chance at the 300 SL, but all they settled for were discussions as to how they'd show 'em next time. The 1953 and 1954 racing seasons went their way without any Mercedes entrants.

At Le Mans in 1954, the rumors began circulating again with considerable abandon.

"I hear Mercedes is getting ready to show them all with a new car. It can do 200 mph in third."

"Pegaso, Pegaso, I tell you there's no such car as a Pegaso!"

"That Alfa-Romeo is good for 175 mph on kerosene, nothing here can touch it."

"What do you mean the Cunningham is racing with a Crosley engine?"

When the practice sessions had ended, the general consensus had Alfa-Romeo's "Disco Volante" at the top of the heap, the car to beat.

To everyone's astonishment, the Jaguar Company entered its factory team of three cars that looked almost identical with the C-types of 1951.

"I ask you sir, what kind of madness is this? Don't they know things have changed since then?"

But as soon as the race began, it was very obvious that they knew things had changed since 1951. In fact, they introduced the one real major innovation. The cars had been beefed up under the hood all right, but they also had a new secret weapon—disc brakes. The new discs allowed them to accelerate sharply and go into the turns at speeds 100 or even 200 yards further than any of the other cars. (The previous Jag brakes definitely had not been equal to the XK's tremendous speed on road circuits.) Furthermore, top speed was higher and earlier suspension and cooling problems apparently had been licked.

There were 67 cars entered in the race. The Jaguar factory team consisted of three cars, all of stock 3442 c.c. capacity. The drivers were Moss and Walker, Rolt and Hamilton, Whitehead and Stewart. In addition there was one non-factory team entered by Ecurie Francorchamps and driven by Laurent and de Tornaco.

At the start, Moss broke out in the lead. He stayed there for the first hour, but then had to make two pit stops to clear a stoppage in the fuel feed. His place at the lead by the end of the second hour was taken by the Rolt-Hamilton C-Jag. Moss dropped back to 21st, and grimly set out to make up time. Rolt was setting a blistering pace, and the Alfa-Romeo team moved up to challenge. The pattern of the race early took the form of an Anglo-Italian duel.

By the end of the second hour there had already been retirements of the Hawthorn-Farina Ferrari, the Allard-Parker Allard, the Parnell-Collins Aston Martin and the Lurani-Mahe Fiat. Fangio's Alfa cracked up and went out with the Cabantous-Veyron Nash-Healey.

The Rolt-Hamilton No. 18 Jag hung grimly on. At the end of 5 hours Moss was up to 11th place, the Alfas and Ferarris were running well and the Lancias, outclassed, were wilting under the strain.

Five hours later and the Jags were running first, sixth and seventh. The Ascari-Villoresi Ferrari was a lap behind in 2nd, the Kling-Reiss Alfa two laps further back, the Fitch-Walters Cunningham fourth, closely followed by Moss-Walker and Whitehead-Stewart in the green Jags. By now twenty cars were out of the race.

With fifteen hours gone, the blistering pace had taken its toll and only 33 cars were left running. Rolt-Hamilton in their front running No. 18 were now two laps ahead of the Ferrari, with the Fitch-Walters Cunningham in third, a gaining Moss-Walker C-Jag behind them and the third Jag now in fifth place.

As the noonday sun rose to its highest point, 20 hours had elapsed. Out on the track, the leading Rolt-Hamilton car was well over 40 miles ahead of its nearest rival, and the Moss-Walker Jag was comfortably in second place, with the Cunningham and the third Jag doggedly fighting for third spot. If the Jaguar team could just hold on for four more hours the rout would be complete.

And there it was! An outstanding victory in the long history of the famed Grand Prix of Endurance. Breaking all records, the Ross-Hamilton team had covered 2540.3 miles at an average speed of 105.85, the first time any car had finished the twenty-four hours at a speed of over 100 mph (the winning Mercedes of the year before had averaged 96 mph). Moss-Walker were second with 2511.2 miles at a 104.81 average. The Whitehead-Stewart car came in fourth, a scant 12 miles behind the third place Cunningham. It had done 2486.1 miles at a 103.76 mph average. The fourth Jag entered, driven by Laurent-de Tornaco had ended the race in ninth position with 2,300.9 miles and a 96.03 mph average.

Only twenty-six of the original sixty-seven starters finished the race. The entire Jag team had gone the full time, and the winners had broken every known record along the way. The victory was complete. Upon their return to Coventry, the victorious Jaguar team drove in procession through crowded streets to the Coventry City

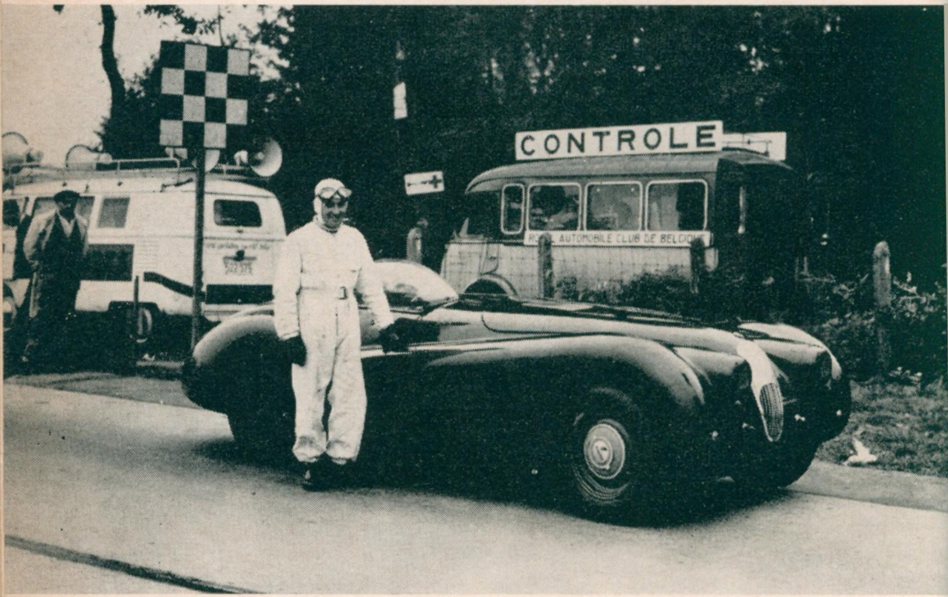
Council House where they were guests of the Lord Mayor at a civic reception. This was indeed a successful race.

The 1953 C-Jag was substantially of the same design as the 1951 Le Mans winner. The frame was of tubular construction with various members triangulated laterally, horizontally and vertically. The front suspension hadn't been altered and was by dependable wishbones and individual torsion bars. In the rear, suspension was by single torsion bar and trailing links with a torque arm fitted to the offside of the axle, in conjunction with a transverse Panhard rod. Both the front and rear suspension systems incorporated Newton hydraulic dampers. Steering again featured rack and pinion. The transmission was through a multi-disc clutch and an orthodox four-speed synchromesh gearbox.

The engine on all Jaguar cars, racing or sedan, is fundamentally the old reliable six cylinder 3½ litre twin overhead camshaft power unit, which first appeared in the XK 120. The major difference here was that while normal production engines were fitted with twin horizontal S.U. carburetors, the Le Mans cars featured three Weber twin choke carburetors. The overhead camshafts were somewhat hotter than stock; the seven-main-bearing crankshaft was reinforced and the car carried twin exhausts with a single outside muffler. But these can hardly be termed changes of major importance. The compression ratio was 8:1 and on 80 octane fuel the engine developed 220 bhp at 5,200 rpm.

In 1953, the factory did not use the ill-fated 1952 styling. The most important single change was the use of disc brakes. In redesigning the car they pared off 120 pounds, but the work on the engine was also of great importance. The changes listed—the three Weber carburetors along with the altering of the ports to allow for the addition of special racing pistons—were not particularly great technological advances, but they did give a substantial increase in torque, from 220 foot-pound at 4,000 rpm on the 1951 C-Jag to 252 foot-pound at 4200 on the 1953 model. The suspension in front was the same, but the suspension in the rear was beefed up by special torque-reaction couplings which were added to the torsion bars, giving the car increased stability. An interesting modification was the synthetic rubber fuel tank, which was a flexible bag weighing only 11 pounds and having a capacity of 50 gallons. There was a single new air duct on the hood and there were no ghosts about as not a drop of water was added to any of the Jags during the entire race.

As the season wore on, the new C-Jags proved that their Le Mans victory was no fluke. They finished a close second to the Ferraris in the 1953 World's Sports Car Championships with a total of 27 points, just three under the winning 30. In the Sebring (Florida) 12-hour sports car race they finished third and fourth. At the Belgian 24-Hour race C-Jags came in second and third. There was a second and a sixth place in the Nurburgring Thousand Kilometer Race and a fourth in the Tourist Trophy. All in all, a good season's work. However, there was one last challenge that had to be met.

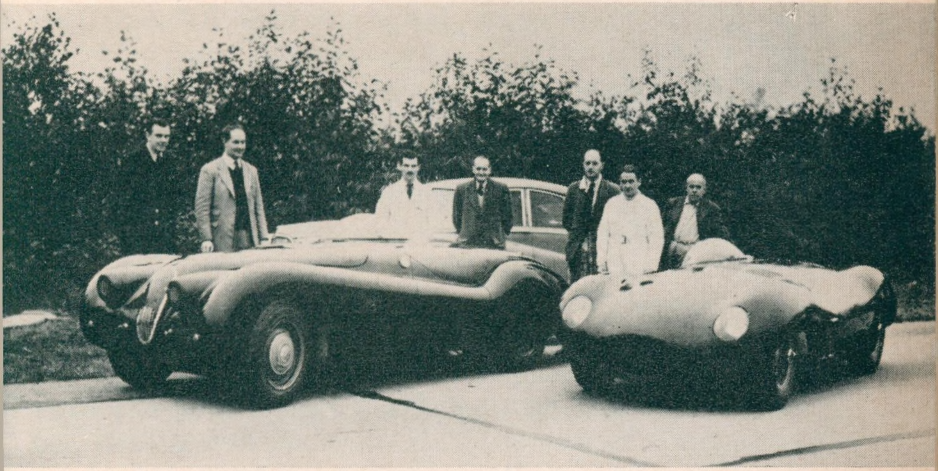

CONTROLE
ROYAL AUTOMOBILE CLUB DE BELGIQUE

Norman Dewis, chief driver for Jaguar, with the XK-120 in which he broke the World's stock production car record for the flying mile. Run was made at Jabbeke, Belgium, October 21, 1953. Dewis averaged 172.412 mph on the Brussels-Ostend Autobahn.

On the Salt Lake flats, an Austin-Healey had just recently made a run of 142.636 mph, thereby gaining the title of the "world's fastest production car." It was a Jag that had won the title of Jabbeke, Belgium when one of the original XK 120's had made its record run of 132.6. Lyons now ordered his racing team to win back this coveted and publicity-rich honor.

A standard XK 120, not a "C", was fitted with catalog speed equipment and a modicum of streamlining and went back to Jabbeke to see what it could do. It did all right. Under the scrutiny of the Automobile Club of Belgium, this XK 120 went on its way and came home the proud possessor of a phenomenal new timed record of 172.412 mph!

At that same timing session, the Jag people brought out a new competition prototype, later to be known as the "D" Jag. On its first official runs against the clock, it blistered the road at timed 178.381 mph. This was just to let the racing world know that there were better things in the offing from the Jaguar Company. Observers noted that this new car seemed much smaller than the old "C."



Beside record-breaking XK-120 was a new "competition model" (right) which did 178.383 mph at Jabbeke. This streamlined job was the forerunner of the famous C-Type Jag.

5. THE "D" IN DETAIL

Simply called the "D", Jaguar's newest competition car made its first public appearance at Le Mans in 1954. The race got under way and soon settled down to a battle between the new Ferrari, powered by its 4954 c.c. engine and the "D." At the conclusion of the 24 hour run, the Ferrari had beaten the "D" by a scant 89 seconds, less than 1½ minutes out of a total of 1440 minutes. A second D-Jag placed fourth. During this race, on the frightening Mulsanne four-mile straightaway, the "D" had clocked 172.76 mph for the highest speed of the day. At the end of the race, when the index of performance was computed, the Jag had actually out-performed the Ferrari because of the 40 per cent greater displacement of the Italian machine. The new Jag competition car had averaged 105.0 mph for the full 24-hour grind. Soon afterwards, running in the Rheims 12-Hour Sports Car Race, D-Jags came in one-two with an average of 104.55 mph.

How did the new car compare with the 1951 and 1953 Le Mans winning C-Jags? Although it was a direct descendent of that line, it did feature a number of important differences.

If you want to improve a car's performance, you try one of two approaches. The power output of the engine is increased to make it push the same body at a faster rate of speed, or the body's resistance to motion is reduced by streamlining and shearing off weight. When an engine is so advanced that a great deal of work is required to gain minor concessions from it, it is often an easier task to start experimenting with body design. In the 1954 D-Jag both approaches were used.

The framework of the C-Jag was tubular, causing the stresses to be taken up by the main frame members. The body panels themselves played a comparatively minor role in providing structural rigidity. In the D-Jag this was completely changed. There was no separate chassis, as such, the car being built around a center section of monocoque construction and immense strength. This made for a rigid structure and was successful in reducing weight. These factors—more power and a lighter frame—coupled with a dry sump system of lubrication which allowed the engine to be lowered and the body to be more streamlined, made the D-Jag a very potent projectile. An indication of the effect of the above treatment can be gathered from the following wind-resistance figures.

If wind resistance alone were lowered, and the same power used to propel a car, its performance would be higher depending directly upon the coefficient of the resistance. Taking the 1953 C-Jag as our starting point, we find that this model had a drag coefficient of 100 per cent. The D prototype that raced at Jabbeke in that year had a drag coefficient of 77 per cent, and by 1954 this had been reduced to 72 per cent. The 1955 car lowered this even further to 64 per cent. We can see, then, that the most important feature of the D-Jag rested in those elements of construction that brought about a lowering in its drag coefficient, as compared with the earlier C-Jags.

The frame of the D-Jag employed a monocoque elliptical central section, fabricated in magnesium alloy. Extra stiffening was provided below the major axis of the ellipse by massive L-section pressings, riveted to the main section to form two tubular members. The front and rear bulkheads were formed by diaphragms enclosing both ends of the center assembly. The front section, which provided the points of attachment for both the engine and the front suspension, was constructed of square-and-round section aluminum tubing and was integral with the central section. The rear section which didn't carry the main load, was attached to the center by bolts around the periphery of the ellipse.

The beam strength of the center section and its torsional rigidity were also increased by four tubular members which extended diagonally forward and were welded to the front cross-member. These embraced the entire power unit. Still further stiffening was provided by an additional two square-section tubes running diagonally forward from the front of the bulkhead and meeting in the center of the front cross-member frame. They passed over, and were welded to, the two upper main frame tubes. The entire body structure was riveted and arc welded of 18 gauge magnesium alloy. To the rear diaphragm were secured two transverse box-section members, which had massive vertical assemblies attached. The two vertical plates were riveted to a channel-section spacer and the whole formed box-section members housing the bearings of the trailing link rear suspension.

The front suspension was essentially the same as the Jaguars had been using, with upper and lower wishbones and torsion bars. The inner fulcrum bearings were in line with the longitudinal center line of the chassis. The torsion bar was offset by 2½ degrees from the center line of the car. The provision of a vernier arrangement of splines enabled the car's height (thus) to be adjusted with no disturbance to the principal suspension parts. The rack and pinion steering unit was carried above and in front of the main cross-member. To this were connected the steering arms, which extended before the wheel center line. The steering column had a universal joint.

In the rear, suspension was by a live axle, trailing links upper and lower, and a single transverse torsion bar. The top and bottom links were of flat steel plate of approximately 2 x ¼ inch section. When the car cornered, the plates forming the suspension links were in torsion, thereby increasing the roll stiffness. It can be appreciated that the material for the links had to allow for flexibility. The four trailing links formed a true parallelogram. The single torsion bar in the rear had an enlarged center section attached to a reaction plate which was bolted to the center of the main body structure.

Both the C-Jag and the D-Jag used the XK engine as their basic power plant. Certainly no greater compliment could be paid to its efficiency and durability. The standard crankcase and cylinder block were used, and the development work on the engine was always concerned with obtaining more power. The reliability of the engine was never in question.

The cylinder block and crankcase were formed from one single iron casting, and the bores were machined direct in the casting. The bores were relatively long and the ratio of the bore to stroke was an unusual 0.778:1. There was provision for ample structural rigidity in the uncomplicated layout of the crankcase. This was afforded by the internal webbing and the arrangement of the housings for the seven main bearings. The crankshaft, which was made of EN 16 steel, ran within bearings of indium-coated lead-bronze. As the engine had no flywheel, the same effect was achieved by fitting the adequate torsional vibration damper to the front of the crankshaft, and by the mass of the triple-plate clutch and the starter ring, which was pressed on the center section of the clutch assembly.

When you look at the D-Jag, it was most apparent that there was a noticeable external difference in the appearance of the engine as compared with the standard XK. This was brought about by changing from a wet to a dry-sump system of lubrication. As the sump height was halved, the engine was reduced in height and this allowed it to be lower under the bonnet, while still maintaining ground clearance. Ancillary to this, the center of gravity, at the point of heaviest weight in the car, was lowered. The dry-sump system of lubrication does bring with it problems that must be overcome. One of the major problems is that the lubricant tends to become aerated. To prevent this the Jaguar uses baffles inside the oil tank, from which a breather pipe runs to the crankcase. The oil falls to the base of the sump after it has been circulated through the engine bearings, and as oil naturally offers much more resistance than air, it must be returned to the tank as quickly as possible. This is done through a dual scavenge pump.

The entire line of Jaguar engines uses a light alloy cylinder head with valve-seat inserts for both inlet and exhause valves. This, of course, was true for the D-Jag. It featured the hemispherical combustion chamber, had domed valves and the compression ratio was raised to 9:1. When the engine was mounted in the car, it was inclined at an angle of eight degrees off the vertical. Then the three double-choke Weber carburetors were set down at a complementary angle to the vertical line of the engine, so that when the unit was fully installed, they lay perfectly horizontal. The engine was mounted in this manner for two reasons. First, it allowed for the overall height of the bonnet to be reduced, and second, it made it possible to place the engine within the complex forward sub-section of the framework. It would have been impossible to mount the engine vertically without modifying the structural rigidity of the framework.

The power of the engine was conveyed to the synchromesh gearbox through a triple-plate clutch. Close ratio helical gears were used. From the rear of this gearbox, the power was further conveyed to the Salisbury rear axle by means of a short Hardy Spicer propeller shaft. This unit was similar to that fitted in the production XK engine with two exceptions: the axle ratio was changed, and the length of the axle tubes was modified.

A great deal of the success of the D-Jag was due to its axle ratio (3.54 standard; 2.92 and 3.31 were factory options), and to the larger than standard Pirelli rear tires. There was also the ability of the engine to withstand occasional bursts to 6,600 rpm at a piston speed of 4,580 fpm! The factory tuned car that had made runs at 183 mph had a hypoid final drive with a 2.79:1 ratio, and 7.00-inch Le Mans tires, used in place of the standard 6.50 tires. This larger sized tire reduced engine revs per mile by about 5.5 per cent. The 183 mph was reached at 6,000 rpm engine speed. It must be remembered, however, that these particular factory jobs had special cylinder heads and various other undisclosed modifications which added 35 more bhp and gave a 9.5 per cent torque increase.

This brings us to the last matter of discussion in regard to the D-Jag's technical aspects. As the engine was giving more power and the drag coefficient dropped sharply, the wind resistance which aided in braking the car was also reduced. This imposed a severe load on the braking system. Dunlop disc brakes were used. They had 12¾ inch diameter discs and three pairs of pads on the front, two on the back. This gave the required braking distribution. All pads were of

2 3/16 inch diameter, providing a total friction lining area of 45 sq. in. in front and 30 sq. in. in the rear. Early experience with these brakes led to a sharp increase in the volume of friction material. Due to the braking required at high speeds, the temperature rises very sharply about the brake calipers. To insure an adequate flow of air, 20 hydraulic brake cylinders were attached to the calipers by means of bolts and sistance pieces. Due to this large number of cylinders, the allowable clearance between the disc and the brake pad was very small. There would be a pedal lag if the clearance were larger. Clearance with the brakes off was 0.010-0.015 inches. Maintenance was through a combination of automatic adjustment and retraction. A Plessy sump driven from behind the gearbox provided for Servo assistance. To inhibit air from being drawn into the system when use of the reverse gear changed rotating direction of the propeller shaft, a non-return valve was incorporated into the system.

One interesting feature of the D-Jag was that its 37 gallons of fuel were carried in two flexible tanks, mounted within two light-alloy boxes. They were quite resistant to damage and would make an excellent safety feature for all racing cars.

By the time of the 1955 Le Mans race, the Jaguar entry had gained the reputation of being a tried, tested and winning team. It was hard to realize that with only four years of racing experience it had met on equal terms and had often bested the prized names of racing, the Ferraris, Maseratis, Alfas, Lancias, Talbots. People had begun to expect things of the Jags, and they weren't disappointed.

With Mike Hawthorn and Ivor Bued driving the winning factory car, the new D-Jag had covered a record distance of 2,569.7 miles at an average speed of 107.07 mph. In third place, holder of the new lap record of 122.39 mph, came the privately owned D-Jag of the Belgian team of Ecurie Francorchamps driven by Swaters and Claes.

There had been major revisions made in the body construction of this new D-Jag. The magnesium alloy central section was retained, but the large expense and the difficulty entailed in repairing the one-piece construction of the 1954 car, (since every joint had been secured by Argon arc welding,) decided the company against its continued use. Therefore, while still retaining the same basic design, the front section was changed to steel tubing. The rear section, which held the spare and fuel tank, and the front section were both bolted to the central magnesium alloy section.

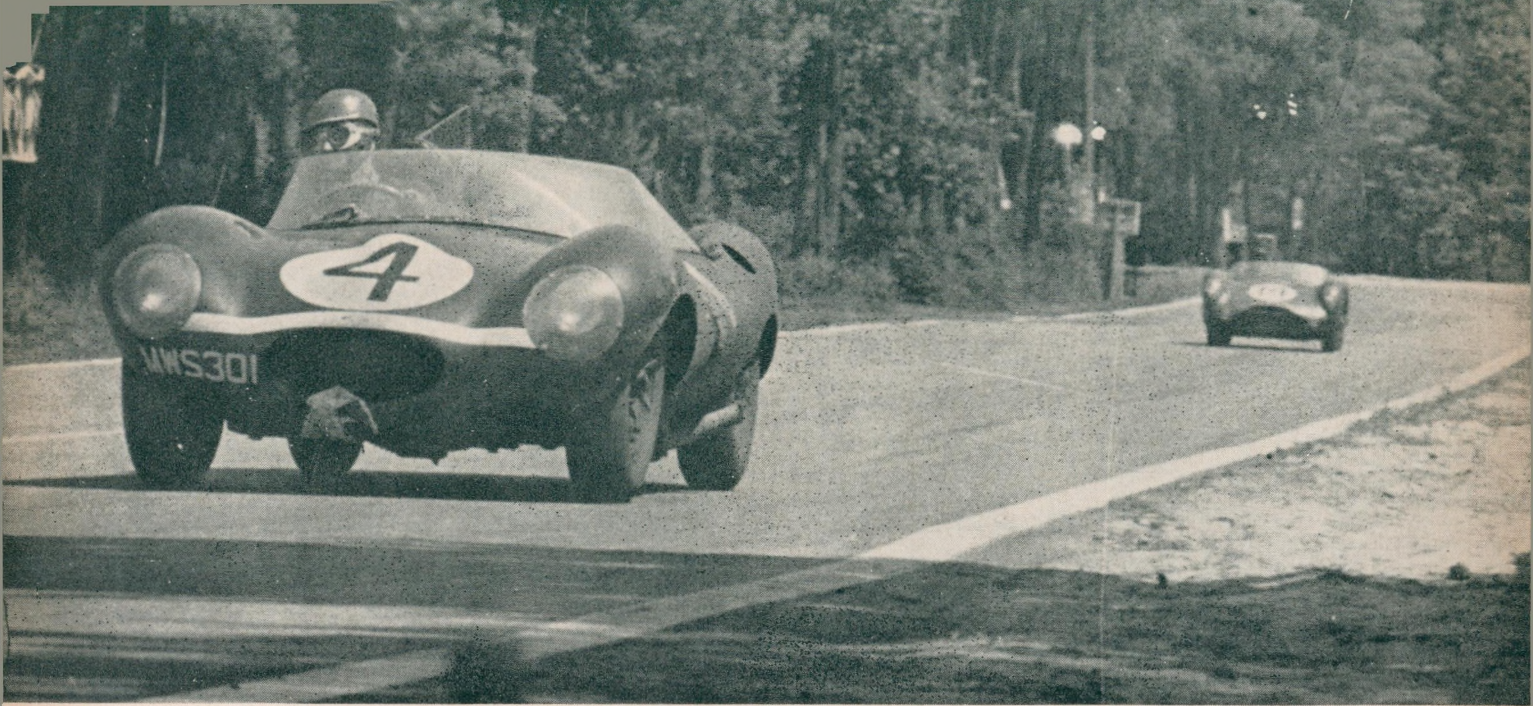
By 1956 it was an old story. This time, though the privately owned Ecurie Ecosse team, with Ninian Sanderson and Ron Flockhart driving, passed the Le Mans checkered flag in first place. Their winning speed was 104.46 mph. Ironically enough, the Jaguar factory team was beaten by the privately owned D-Jag and finished fourth and sixth. It was almost beginning to look as though the Le Mans course was the Jaguar's own hunting ground.

A production model of the D-Jag was made available in 1956. It had the body and framework of the 1955 car, while the engine was most similar to the one run officially in 1954, and in fact the power output was the same. The substitution of the new steel tubular frame in place of the aluminum one resulted in slight weight reduction. The total weight of the bare framework was now 56 pounds.

The engine here again was basically the same one available to every Jaguar XK owner. Slowely but surely we have seen the improvements that were made in the power of the engine. We have watched it step up from 120 to 140 through 160, 210 and 250 to 285 bhp. The Mark VII's output was 190 bhp. The Mark VIII has 210 bhp and the brand new Mark IX, 225. It can readily be appreciated what a large margin of safety was built into the original engine, considering that it withheld over 25 per cent of its potential power.

It is also worth taking note that the maximum power of the D-Jag engine was obtained at 5,750 rpm, and that when using the 2.79:1 Le Mans gear ratio and the 7.00-in. tires, the record speed of 183 mph was made at only 6,000 rpm. This figure shows that there was a considerably narrower margin of revolutions over the peak of the power curve needed to obtain maximum speed than is normally found on medium-sized production saloon cars.

The production model of the D-Jag did 162 mph. The discrepancy between this speed and the 183 mph the factory got out of the



Le Mans, 1956: the victorious D-Type Jaguar of Sanderson and Flockhart during the latter stages of the race. Privately owned and entered by the Scottish racing stable of "Ecurie Ecosse", this car average 104.47 mph for 24 hours.

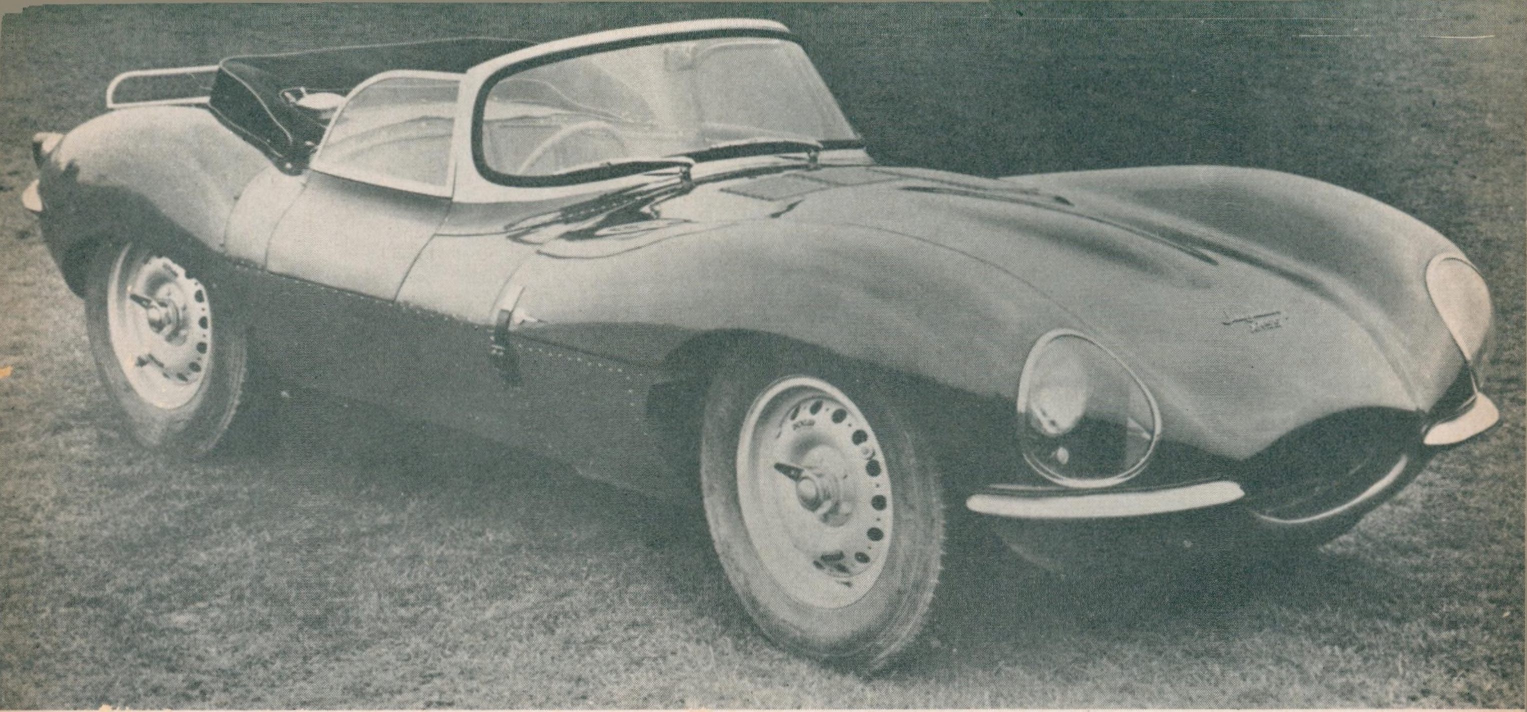
car was due, as mentioned above, to the fact that production models were not hopped up to anything like the extent of the factory cars.

That the D-Jag was one of the most magnificent production automobiles in the world is tribute in itself. But when it is realized that this car was also priced far beneath comparable competition cars, we can once again see that strong element of productive genius that has throughout his career guided Lyons in building up his motor company.

The production of both the earlier C-Jag and the later D-Jag was severely limited. Lyons had determined that these cars should go only to known or accredited drivers who were in a position to race. The company had spent thousands of dollars and man-hours in their development. It was only right that the distribution of such valuable machinery be closely supervised. If you happened to be named Farina or were a world's champion or Grand Prix driver, your chances were good of getting one. If you happened to live in Westport, Connecticut, and business had been good that year, you would need to look elsewhere for your second car.

Before this brief run-down of the Jaguar's racing history is completed, the inclusion of two more or less unrelated items is necessary to bring the chapter to a close. The first is the introduction of the production model XK-SS and the withdrawal of the D-Jag from manufacture and from sale. The second item is (at this writing) the Jaguar Company's recent announcement of its intention to suspend racing.

In May of this year (1957), the Jaguar Company shipped the first of its new XK-SS models to the U.S. Although it had withdrawn its D-Jag, the SS cannot be said to be merely mustard for the steak. The XK-SS is, in essence, the D-Jag in a slightly modified form. The engine, of familiar XK 3442 c.c. capacity, has a 9:1 compression ratio and develops 262 bhp at 6,000 rpm, or 12 bhp more than the racing D-Jag offered for sale in 1956. Its weight is 2,040 pounds. Full specifications are listed in the appropriate table. This car, which was intended to sell for somewhere in the vicinity of $5,600, was aimed primarily at the SCCA production car racing category. How-



The Jaguar XK-SS, introduced in 1957 as a production model, has the exterior trimmings for daily use (windshield, side-screens, top, and luggage grid), but is basically the 1956 D-Type race car. Output of 262 bhp is 12 hp more than the 1956 D-Type. Coventry fire destroyed much of original production line, but 300 cars will be built by 1958. Price is $5600.

ever, a fire at the Jaguar plant in Coventry on the night of February 12, 1957, destroyed many of the tools and much of the equipment that were to be used in producing the XK-SS. As the company could not guarantee the manufacture of the 150 cars required to qualify for the production class as originally intended, this model was removed from the category by the SCCA Contest Board.

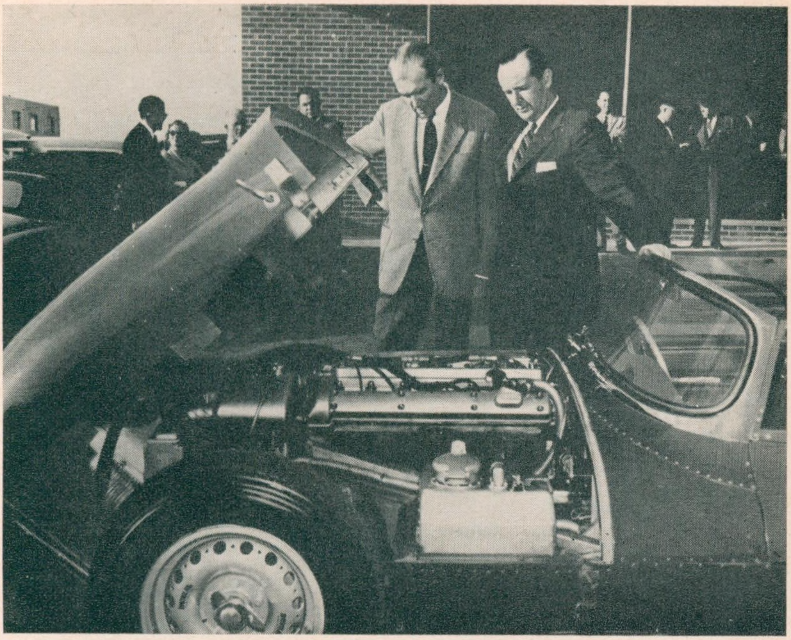
In any case, it is questionable whether the installation of a windshield and a luggage grid on last year's modified D-Jag body (equipped with an even more powerful engine than the 1956 job) could be said to constitute a true production sports-touring model. The XK-SS undoubtedly observed the letter of SCCA production car racing rules, but hardly their spirit. Shortly after the SCCA ruling, the SS was taken out of production altogether.

At any rate—"We race what we sell and vice versa, so the customer is sure of getting a good car," is an apt enough remark that Sir William Lyons is quoted as having made as recently as March 22, 1956. This profound thought, which appeared in the London *Daily Mail* in a column about Sir William, is one to which any Jaguar customer will attest. However, it was known long before the arrival of the XK-SS.

There has been a lot of discussion since the year one as to the beneficial effects of racing on the showroom product. Does it really do anything constructive for the average production job? Or does it simply teach the manufacturer how to build faster competition cars? Indianapolis Speedway, where little appears to have emerged in years, other than the rear view mirror, seems to answer the second question. On the other hand, many European circuits faithfully simulate road conditions and help pinpoint weaknesses that directly affect the improvement of the breed.

Sir Willion Lyons, who today is convinced that racing has done the general car-buying public a meritorious service, has this to say:

"Not only in world prestige, but also technically, we have benefited by the lessons of our racing experience. To take one example, in the days before we raced it was usual to supply owners with recondi-



Movie star Jimmy Stewart and C. Gordon Benett of Jaguar North America examine the new XK-SS.

tioned engines after 50,000 to 60,000 miles. Nowadays, the engines seem to go on indefinitely."

There can be little doubt that many improvements an owner is thankful for today are the result, directly or indirectly, of Jag's short five-year racing history. For never has any company gone to the top so swiftly and remained there consistently. As better means for increasing power and reliability were discovered through racing, these improvements were passed on to the production models, which it must be remembered had the same basic engines as those which brought home so many trophies the world over.

"International events are an enormous strain," says Sir William. "Only a first class motor car could win the gruelling Le Mans race." There is no doubt but that the Jag is all that.

Despite Lyons' predilection to racing, the Jaguar Company announced seven months later on October 13, 1956, its withdrawal from the field of international racing and competitive events, and stated that no official entries or work teams would be seen at any events on the 1957 calendar. This might be because Jaguar is at work on a new racing model; or it could be that the company intends to put all its talents towards a new production model.

One guess is as good as another. The announcement went on to state that as a result of the highly successful racing program which the company had undertaken for the past five years, much of the knowledge gained from this experience has been applied to production cars.

Is there an all-new Jaguar in the offing? Has the limit once again been reached with the present power plant?

The following announcement may offer a hint:

> Nevertheless, an annual racing programme imposes a very heavy burden on the Technical and Research Branch of the Engineering Division which is already fully extended in implementing plans for the further development of Jaguar cars.

However, it would be unwise to discount the idea that work is under way on a new concept in racing cars—especially in view of this statement by the Jaguar firm:

> Although withdrawal from direct participation in racing in the immediate future will afford much needed relief to the Technical and Research Branch, development work on competition cars will not be entirely discontinued; but whether the Company will resume its racing activities in 1959, or whether such resumption will be further deferred, must depend on circumstances.

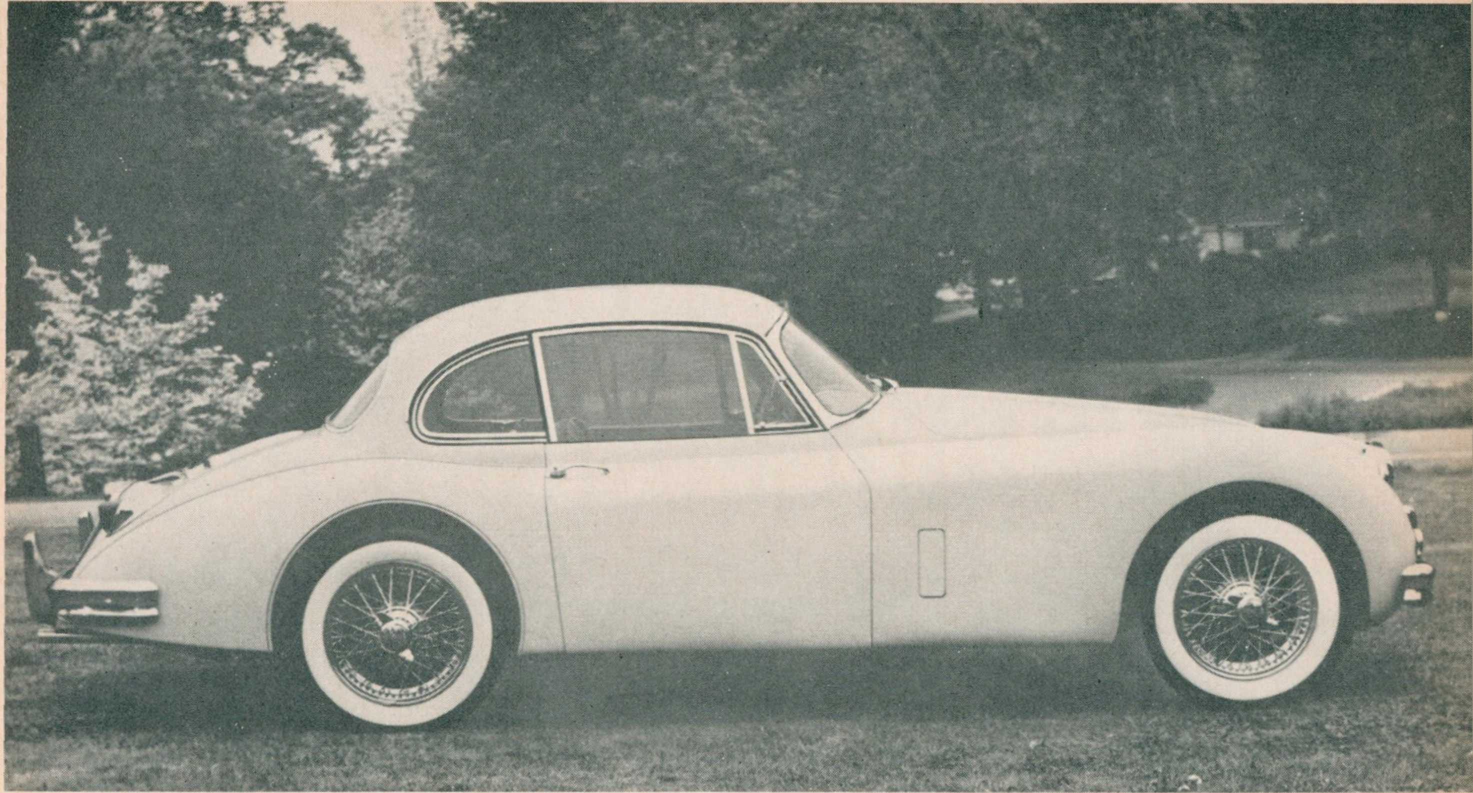
From a full reading of the past history of the company and the rather definite patterns of development, a good guess might be made. Reading between the lines, these statements do imply that activity is now being directed towards the development of a new engine. In the past, whenever an engine reached its peak and the limit of its inherent possibilities, Lyons set to work on a new engine.

This was the case in 1935, when Lyons and Heynes agreed that the old Standard side-valve had about reached its optimum. Then came the famous SS-100's power plant, and the engine around which the first of the Jaguars was built. When this had also gone as far as it could, the new "X" engine started on its long road of development, culminating in the magnificent XK, which has powered every Jaguar automobile since 1950.

It is now nine years since the XK 120 Super Sports was introduced. The horsepower has gone up over 100 in that time, and after seven years of using this engine for the entire line, it could be the psychological moment for a new appeal to be added to Jaguar. Many owners and would-be owners might say this is not needed. But uppermost in the solid business mind of Sir William Lyons probably run the thoughts of increasing competition and further expansion. Various indications point to the fact that since the present XK power plant has about reached its optimum, we shall see an entirely new engine emerging in the not-too distant future. And with it, what would be more logical than restyled bodywork?

This is certain: Jaguar does not believe in "dream car" experimentation of the Detroit variety, where theoretical cars remain theoretical for now and forever. Heynes, who designed the XK engine and was responsible for both the C and D Jags, is not at all impressed with the concept of building elaborate and costly experimental jobs that cannot be produced. His belief is to come up with new ideas that can be pressed into service as soon as possible. It was only a short seven months from the drawing board to Le Mans in 1951 with the C-Jag. The new XK-150 and XK-SS were completed within three months. The first time that Jaguar tried installation of fuel injection was on a D-Jag that ran in Le Mans in 1955, and finished 6th despite a 75-minute pit stop to repair an elusive fuel line. The Mark VIII grille almost emerged between supper and breakfast. So there is no doubt that something is brewing. And when we remind ourselves of the new Lyons concept towards racing, "We race what we sell and vice versa . . ." it does not appear that we will have too long to wait before a new Jag is winning again at Le Mans. What this may mean to the new production cars is nice to contemplate.

What the present XK engine has accomplished with one modification or another may be seen in the summary of the major and international races in which Jaguar made history from 1949 to 1956.



The new XK-150 Coupe features many detailed improvements, including disc brakes.

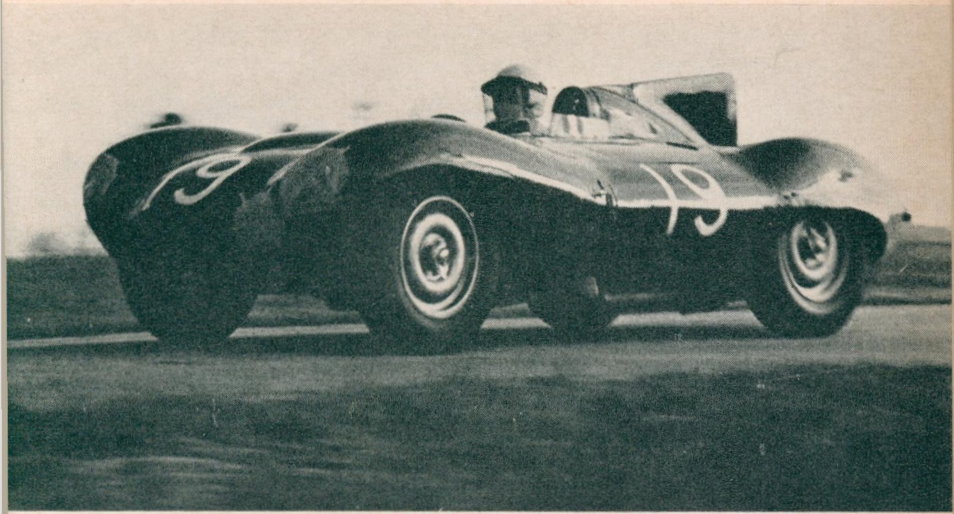
Jaguar Racing Successes
International and Major Events Only

1949	
Silverstone, England	Jaguars first and second in the One Hour International Production Car Race, winning the race outright irrespective of class.
1950	
Tourist Trophy Race, Northern Ireland	Jaguar, first, second, and third. Won race and trophy outright, team prize and award for greatest distance.
Silverstone, England	Jaguars first, second, fourth and fifth in Unlimited Class and also won the Team Prize.
International Alpine Trial	Jaguar returned the best performance of any car, irrespective of class or size, winning Alpine Cup. Also placed first in its class, returned fastest lap in the flying kilometre, fastest time in acceleration and braking tests, fastest time in timed climbs and won eight other awards.
1951	
Le Mans, France	Won by Jaguar. Record speed 93.5 m.p.h., record distance 2,244 miles, record lap 105 m.p.h.
Tourist Trophy Race, Northern Ireland	Jaguar first, second and fourth. Gained team prize and award for greatest distance. Obtained record fastest lap 86.40 m.p.h.
Silverstone, England	Jaguars first, second, third, fourth and fifth, and again carried off the Team Prize.
Internat'al Production Car Race, SPA, Belgium	First in Unlimited Class, returning fastest lap of race.
International Alpine Trial	Jaguar makes best performance and gains three team prizes.
R.A.C. International Rally, England	Jaguar first in Unlimited Class and returned best performance in all speed tests.

Liege-Rome-Liege Rally	Won outright by Jaguar who finished first and second, and carried off team prize. The winning Jaguar completed the 3,000 mile course without the loss of a single mark, the only occasion on which this has ever been achieved.
Dutch Tulip Rally	Jaguars first and second, returning best performance in all tests of speed, braking and maneuverability.
Goodwood Circuit, England	In the 1501 c.c.-3500 c.c. B.A.R.C. Sports Car Race Jaguar came in first and made fastest lap of 84.83 m.p.h. Also, first, second, third in the Sports Car Handicap Race (from scratch) with the fastest lap of 86.02 m.p.h.
Rallye du Soleil, France	First, second, third and fourth, returning best performance in all tests.
1952 **Rheims Grand Prix, France**	Jaguar first and second. In Unlimited Class, covering the 223 mile course at an average speed of 98 m.p.h.
Silverstone, England	For the fourth year in succession, the Production Sports Car Race was won by Jaguar. In the Production Touring Car Race, held for the first time, the Jaguar Mark VIIs were entered and finished first and fourth.
Sebring Intl. Grand Prix, Florida, U.S.A.	Jaguars first in Unlimited Class.
Internat'al Production Car Race, SPA, Belgium	First and second in Sports Car Class, and first and second in Touring Car Class. Fastest lap of race.
International Alpine Trial	For the third year in succession a Jaguar XK 120 completed the Rally without the loss of a single mark and thus gained for its owner (Ian Appleyard) the first Coupe D'Or ever awarded.
Hyeres 12-Hour Sports Car Race, France	A Jaguar won the Over 3000 c.c. Sport Car Class in the face of strong opposition from Ferraris, Talbots and Simcas.

Tour de France	XK 120 Fixed Head Coupe won the over 3-litre category.
Intl. Wakefield Trophy, Curragh, Ireland	Jaguar first and third.
Goodwood Circuit, England	Jaguar first in the B.A.R.C. International Handicap Meeting.
Rallye du Soleil, France	In the over 2500 c.c. Sports Car Class, Jaguars filled the first twelve places with the exception of sixth place.
1953 **Le Mans, France**	First, second, fourth and ninth. Record distance 2,534.6 miles, record average speed 105.85 m.p.h. First occasion race was won at over 100 m.p.h.
Rheims Grand Prix, France	Won by Jaguar at an average speed of 105.5 m.p.h. Jaguar also obtained fourth position.
Silverstone, England	A Jaguar Mark VII won the Production Touring Car event for the second year in succession, and set up a new lap record for touring cars of 76.36 m.p.h.
International Alpine Trial	Jaguars first, second and third in Unlimited Class and winners of three Alpine Cups. Jaguars alone, of all makes, achieved fastest times in all six timed tests.
R.A.C. International Rally, England	Jaguar XK 120 made best performance in the whole Rally and best performance by a sports car. Jaguars also won the team prize. A Jaguar Mark VII won the over 2600 c.c. Touring Car Class.
Hyeres 12-Hour Sports Car Race, France	Over 3000 c.c. Sports Car Class won by Jaguar. Also, first, second and third in the Over 2-litre class.
Lyons-Charbonniere Rally	Won outright without loss of single mark.
Nurburgring	First and second in the Over 2-litre Production Sports Car Class. In the general classification, a privately owned and driven Jaguar finished second.

Rallye du Soleil, France	The Over 2-Litre Touring Car Class won by Jaguar and in the Sports Car Category Jaguars finished second, third, fourth, fifth, seventh, eighth and ninth.
1954 **Le Mans, France**	Jaguar finished second in General Classification and a privately entered XK 120 "C" type finished fourth.
Rheims Grand Prix, France	Jaguar first and second.
Silverstone, England	Jaguar Mark VIIs finished first, second and third in the Production Touring Car Race General Classification and over 3000 c.c. class.
International Alpine Trial	Jaguars finished first and second in the Unlimited Class.
1955 **Le Mans, France**	Won by Jaguar. Record distance 2,569.7 miles; record average speed 107.07 m.p.m.; new lap record for circuit of 122.39 m.p.h. A privately entered "D" type finished third.
Tourist Trophy Race, Northern Ireland	A "D" type Jaguar, driven by Mike Hawthorn, set up a new course record of 94.67 m.p.h.
Silverstone, England	In the Production Touring Car Race, three Mark VIIs finished first, second and third, setting up a new race record of 78.92 m.p.h. and a new lap record for touring cars of 81.06 m.p.h. They also carried away the Team Prize. In the Sports Car Race, Jaguars finished first, second and third in the over 3,000 c.c. Class, setting up a new sports car record of 95.79 m.p.h.
Sebring International Grand Prix, Fla., U.S.A.	Jaguar "D" type outright winner. The Jaguar established a new course record with an average speed of 79.3 m.p.h.
Monte Carlo Rally	A team of Mark VII Jaguars won the Challenge Charles Farou for the best performance by a nominated team of three cars.
Ulster Trophy Race	This event won outright by Jaguar who also won the handicap section.



Phil Walters and the winning D-Type Jaguar at Sebring in 1955.

1956 **Le Mans, France**	First, fourth and sixth. Winning average 104.46 m.p.h.
Rheims Grand Prix, France (Note: 1953, 1954 and 1956 were 12-hour races. No race held in 1955).	Four Jaguar "D" types broke the record. First—1332 miles at 111 m.p.h. Second—1327 miles at 110.58 m.p.h. Third—1322 miles at 110.14 m.p.h. Fourth—1303 miles at 108.55 m.p.h. Jaguar won the General Classification as well as gaining 4 places in the 1500-3500 c.c. race, setting a new lap record at 118 m.p.h.
Silverstone, England	Touring Car Race won by Jaguar.
Internat'al Production Car Race, SPA, Belgium	First in Sports Car Race, setting new lap record at 115.525 m.p.h. First in Touring Car Race.
Monte Carlo Rally	Won by Jaguar.
1957 **Le Mans, France**	First, second, third, fourth and sixth. Winning average 113.85 m.p.h. First time in Le Mans history that one make occupied first four places.

6. THE JAGUAR PEOPLE

Sir William Lyons, who started it all back in 1922 at the age of 20, stands today tall and trim, his straight white hair accentuating his chiseled features, a picture of immense energy wrapped in a package as immaculate as a brand new Mark VIII. He is probably the least vocally expansive and pretentious head executive in all motor industry, but at times can be devastatingly sarcastic.

"We sell Jaguars," he reminds you, "not Lyons. I haven't very much use for words without action. I like to get things done."

He is not fond of personal publicity when it doesn't relate to Jaguar, and even wears his knighthood impersonally, "It was a tribute to the part played by everyone in our organization."

Both his reputation and that of Jaguar are built on a basis of loyalty. The working team that makes up the Jaguar staff is held together by it, and the product that they make has generated it. William M. (Bill) Heynes, probably the greatest single influence in Jaguar technical mastery, has been mentioned repeatedly. Now a Director and Vice-President of the Company, he is still its Chief Engineer. Just touching fifty, with an easy smiling, but quiet disposition, he accepts his role in the rise of Jaguar with a characteristic modesty,

"I've got a great team y'know. Claude Bailey, my chief designer, 'Tat' Tattersall, Bill Thornton and the rest of the gang."

Heynes, as hard a worker as there is, often puts in 18 hours a day engineering, testing, designing and planning. Racing Manager "Lofty" England is in charge of the service department and overseas equipment. Arthur Whittaker, the General Manager and also a Vice-President, has been with Bill Lyons for over 30 years, driving hard bargains with Jag's suppliers. He is in great part responsible for the weather eye kept on costs that enables Jaguar to produce so economically. Tall, balding John Silver is Production Manager and handles the machinery that goes into planning the company's production methods. His counterpart in personnel is solid outspoken Ted Orr. These two men are responsible for keeping the factory going and maintaining the high level of Jaguar quality. The rest of the executive staff runs to about fifteen men, all answerable to Lyons.

That it is a hard-working staff no one will dispute. That it may be overworked is a matter for conjecture. Certainly no one overworks himself more than Sir William who is chief designer, production expert, policy planner and salesman. His pace and energy seems to increase with the horsepower of each new engine.

Cost problems are a major factor with Jaguar especially, because they have built up a tradition of high quality at most moderate prices. It is sometimes not easy to maintain this policy in face of higher prices, costlier tooling and labor and the expense of keeping up adequate overseas distribution. Jaguar has achieved economical productive efficiency by high mechanization and because its executive staff believes in overworking itself. Lyons strongly believes that as many operations as possible should be done by machines; accordingly he spends huge sums of money in buying the latest and the best in automatic equipment where he feels it can be substituted for manpower. There still is a considerable amount of handwork, however, for there are many things a machine cannot do, particularly when it comes to finishing details. Also, each new Jag is fully road tested at the factory, which is expensive, but helps keep a quality control over new cars. The executive staff of Jaguar certainly ranks as one of the hardest working groups in the business. The small conclave that runs the company is constantly meeting and planning. Decisions are made swiftly. The decision to go ahead with the 3.4 and the subsequent introduction of the XK 150 were steps taken with very little marketing research or sales analysis. Far-reaching policy decisions are often made very quickly, almost by intuition. Naturally, this amounts to a great saving, and expenses involved in activities other than production are kept to a minimum. The staff tackles a new problem or design with amazing intensity and can often bring an idea into fruition within a matter of several weeks or a few months. This results not only in keeping costs down but also enables them to be ready to take swift advantage of changing public taste or to incorporate new engineering advances into current production models.

The team of Lyons and Heynes works together admirably well. There are differences of viewpoints. Heynes is a staunch advocate of racing, both for publicity purposes and for engine and body development work. Disc brakes are a result of racing. Fuel injection was first tried out at Le Mans. Heynes, a ceaseless and tireless engineer would like to see Jaguar really become part and parcel of the racing picture. But Lyons still staunchly maintains that primary emphasis should be on production work, where the basis of the company lies. The compromise of these two viewpoints has been a happy development for Jaguar.

Lyons and Heynes are in agreement on the need for a newer family type sports car. In the almost ten years since the XK 120 was first shown, many of the old XK owners have become married, raised families and looked longingly back on the days of their roadsters. This is the ready-made market Jaguar believes is now waiting.

On February 12, 1957, a fire swept the Jaguar plant in Coventry and gutted over a quarter of the factory. It completely destroyed the main stores and hundreds of finished cars, causing damage estimated at over eight million dollars. Lyons, who spent most of the night assisting the firemen, was back at work with his staff the next morning to clean up the debris and get production going again. As a symbol of the company spirit, the orange and blue house-flag, reserved normally for special celebrations, was hoisted at full mast over the crippled factory. Three days later, the company announced that the firm would produce 100 cars the following week, and gave assurance that an American order for 2,000 cars would be filled.

The teamwork that has succeeded in making Jaguar what it is was clearly in evidence the night of the fire. Office girls in high heels and nylons helped push burning cars from the factory. The water was ankle deep, black and dirty. The executives, clerks and factory men were working beside them, and together they were able to save over 400 cars.

It was the first time, even taking into account the war years, that production at Jaguar had been halted. Yet, on the day following the fire, with the roof still sagging and the staff dragging away twisted girders, Austin Pope, Chief Jaguar Tester, put the test bays into operation. Within two weeks they were up to 50 per cent of production potential. And within a period of two months from the night of the fire, the company produced over 1300 cars.

According to Sir William, Jaguar has built up its reputation for producing luxury cars "because we give the buyer everything he wants at a price which offers best value for the money."

If you ask him just how he has managed to achieve this highly desirable objective, he smiles slightly and remarks:

"Success is due to making a first-class car by high-efficiency methods; a luxury car produced in greater number than any other car of its type."

Practical proof that this formula works are the million square feet of plant space in which 4,000 Jaguar employes are busily striving to raise the output of Jaguar towards a planned 250 cars a week. It's been a long step from the workshop on Cocker Street with its maximum daily output of two cars.

With a sale of over $70,000,000-worth of cars in the United States since 1950, the Jaguar firm deserves its title of top dollar earner, though this is somewhat tough on the British who get only 40 per cent of the firm's production for home use.

The American subsidiary, Jaguar Cars, Inc., is now headed by Johannes Eerdmans.

"No radical changes seem to be in the offing," says Sir William, "except advancements in transmission, suspension, disc brakes and fuel injection. We hope to be in the forefront."

7. MAINTENANCE AND STOPPING

The large Jaguar Parts and Service building in Long Island City, New York, has a vast room divided into several aisles formed by parts bins reaching to the ceiling. Much of the spare parts business, it seems, is the outcome not of car failure but of owner failure. Despite official factory bulletins and a variety of warnings transmitted to owners through dealers, hardly a day goes by without some enterprising automotive genius deciding that his Jag should be de-stroked to three litres or bored out to four litres, or that the compression ratio should be hiked to 12 to 1 or some other form of mechanical mayhem committed on his car. This is one form of activity more or less guaranteed to boost the sale of Jaguar replacement parts. Another supporter of the Long Island City building is the owner who needlessly abuses and maltreats his Jaguar.

Although notorious gluttons for punishment of all kinds, the good old XK 120 and its later brethren will stand just so much and no more of neglect, half-cocked maintenance and amateur "modification."

Maintenance of the Jaguar is not a difficult task, and provided it is performed conscientiously and in the recommended sequence of operations, resultant performance will amply repay the owner. If he ignores this facet of ownership responsibility, or tries to tamper with basic design, he is simply looking for trouble—expensive trouble.

The purpose of this particular chapter is therefore twofold: first to warn off engine and chassis modifiers who think they can go one better than the manufacturer; secondly, to offer some practical check-up, maintenance and tuning hints officially approved by the Jaguar factory.

To begin with, since Jaguar has been developing the XK engine for 10 years, its designers should know it reasonably well by now. They have an extensive backlog of manufacturing, experimental and racing experience to draw from, and when they advise "Leave it alone," this can be interpreted as sound advice. Competition-minded Jag owners with an obssessive purpose to hop up their cars would do better to spend those extra C-notes on a good used C-type, or even a D. In the long run, it will be cheaper and far more rewarding.

Before starting an engine check-up or adjustment, the temperature gauge should be allowed to run up until it reads 70° Centrigrade, which is the normal operating temperature. At this point, quick warming-up of the engine can be checked to determine whether the thermostat of the cooling system is operating correctly. If the engine runs too cool, it can never hope to achieve optimum performance.

Compression Test: If the engine burns an undue amount of oil or appears to suffer from lack of power, a compression test will quickly help determine whether this condition is serious enough to call for a major overhaul. With all six spark plugs removed, the water outlet temperature at 70° C. and the engine turning over at cranking speed, the compression gauge should read not less than 120 psi with the 8 to 1 compression ratio cylinder head. If any of the cylinders register marked variations below this figure, the trouble probably lies in incorrect valve seating, although the piston rings may also be suspect. In that case, it will be necessary to remove the cylinder head, take a close look at the pistons and reface and regrind the valve seats.

An overhaul of this kind is best left to a qualified mechanic, but before going ahead it is worth noting that marked differences in oil viscosity can measurably influence variations in compression pressure.

IMPORTANT NOTE: When using the electric starter to crank the engine for purposes of making the compression test, the ignition switch must NOT be left on the "On" position. The starter can be activated by using the push-button on the starter solenoid switch attached to the scuttle.

Ignition Test: A good fat spark delivered at the right moment is the life source of any engine. But before the true condition of the ignition system can be determined, it is first necessary to make a routine check of that usually neglected component—the battery.

Check, first, to see whether the battery electrolyte (liquid) level is correct. If the level is low and the plates are exposed, sufficient distilled water must be added to just immerse the separators. Check, also, that the battery is sufficiently charged and examine all connections to make sure they are clean and tight. Sulphation (a greenish-white deposit) of the electrodes is usually not a good sign. This deposit must be cleaned off with a wire brush and a smear of vaseline applied to the connections.

The distributor cap may now be removed to determine the condition of the carbon brush (inside the head of the cap,) the rotor arm, the points and the segment (contact breaker spring arms). Make sure that the carbon brush is in proper contact with the rotor arm. A fault, here, can result in a mysterious loss of power (through a weakened spark jumping across the rotor) that will send the owner scuttling off in a dozen other directions. The writer had this experience with an XK 120M just before the 200-Mile race at Elkhart Lake, Wisconsin, in 1952. If the brush moves *freely* against its spring in the distributor cap, all is well.

The distributor cover may now be removed and cleaned with a rag, after which check the free operation of the centrifugal advance mechanism and lubricate lightly with thin oil. A drop or two on top of the distributor spindle will suffice.

The contact breaker points should be cleaned, checked for pitting or burning and, if necessary, replaced. Bad pitting of the points may be due either to an incorrect gap or to a faulty condenser. The gap should therefore be checked first, using a feeler gauge, with the points just about to break open. Slight wear of the points can be dressed with a special file, but this is a job requiring special care and a sensitive touch to avoid changing the contact plane of the two surfaces. Dressing the points in this manner will have the effect of slightly retarding the spark, but this can be corrected by using the Vernier adjustment on the distributor—if at all necessary.

In setting the gap of the contact breaker points, the following tolerances should be observed:

XK 120 Engine: #5509 onwards (distributor stamped 40199E on body) .014—.016-in.

Mark VII Engine: #B-4098 onwards (distributor stamped 40372A on body) .014—.016-in.

Prior Models: All distributors fitted to engines with prior numbers to the above should have the gap set at .012-in.

XK 140, XK 150, 2.4 litre, 3.4 litre and Mark VIII engines: Gap should be set at .014—.016-in.

Smear a little light grease on cam and drop a spot of oil on the contact breaker rocker pivot. Replace the distributor cover and make sure it is properly seated so that both spring clamps snap into position.

All HT and LT connections on the distributor and coil should be checked for tightness; wire and cable insulators should be examined for any faults or breaks. Where necessary, replace damaged wires and leads. Patching-up a potential source of electrical leakage is merely a way of deferring trouble and should only be resorted to when no immediate replacement is available.

The vacuum advance mechanism should also be checked for correct operation with the engine running. If the vacuum is operative, the micro-screw will be seen to turn into the distributor body.

Correct plugs are an equally important factor in an efficient ignition system. Much can be told about the carburetion of the engine by examining the points and insulation of the spark plugs. A light brown insulation and a fine, dry, very fine carbon film on the points and the rim of the plug shank usually denote correct mixture. Light gray insulation indicates that the engine is running over-lean; sooting and fouling up of the plug denotes the opposite. It is important to distinguish between a carbon deposit that is the result of combustion and an oily deposit suggestive of more serious trouble. If the wrong heat range of spark plug is used, (i.e. a plug too cold for ordinary moderate speed and traffic use), it will tend to soot up in much the same way as would result from an over-rich mixture.

Sand-blasting a spark plug is not a recommended form of cleaning, especially if the plug is being used in a high-performance engine such as that of the Jaguar. A better method is to pour sufficient carbon-tetrachloride fluid into a bowl to immerse the plugs, cover the container with a piece of cardboard and let the immersed plugs stand overnight. By morning, the "carbon-tet" will have pried loose from the plug the most obstinate carbon deposits and it can then be wiped clean. Since the fluid is highly volatile, it dries off almost at once when exposed to the air. It is also quite harmless and is the fluid used in fire extinguishers. CAUTION: Care must be taken to avoid inhaling the fumes when handling, as "carbon-tet" is NOT harmless to human beings.

With two exceptions, the spark plug gap for all XK engines should be set at .022-in. The exceptions are: 2.4 engine (.030-in.) and 3.4 engine (.025-in.).

Champion N8B plugs are normally recommended for touring use with the 8 to 1 compression ratio engine, unless it is fitted with the C-type cylinder head. In that case, the NA8 should be used.

For racing, install the NA8 plug, or the NA10 with the C-type head. The D-Jag and the XK-SS both use Champion NA8 spark plugs for normal roadwork and NA10 for racing.

When the plugs have been cleaned and correctly gapped, they should be set aside and not replaced in the engine until valve clearance has also been checked. This facilitates turning over the engine.

Valve Clearance Adjustment: This must be carried out with the engine COLD. Remove camshaft covers, taking care not to damage the cork gaskets, and check tappet clearances with a feeler gauge before adjustment. To obtain accurate settings, each valve must be checked with the tappet at the base of the cam. After each adjustment, clearance should be re-checked.

The following are the recommended valve clearances for Jaguar engines:

Engine	Inlet	Exhaust
Mark VII, Mark VIII, 2.3 and 3.4 litre	.004-in	.006-in
XK 140, XK 150	.004-in	.006-in*
XK 120	.006-in	.008-in
XK 120M, XK 120MC	.006-in	.010-in
D-Jag, XK-SS	.006-in	.010-in
	.008-in	.012-in

NOTE: The XK 120M engine is identified by the letter "S" prefixing the chassis number and suffixing the engine number.

* .006-in and .010-in for competition.

Carburetor Adjustment: The dual SU carburetors fitted to all Jaguar engines (with the exception of the D-type which is equipped with Webers) are of a time-honored design, both simple and highly efficient. Provided the sequence of operations is carried out with care and in the proper order, the SU carburetor can be adjusted easily and accurately, and synchronized with little more trouble.

The first step is to check the operation of the SU electric fuel pump to make sure that it is delivering correctly. Remove the filter at the base of the pump body, clean and replace.

The air cleaner and air cleaner manifold (on the sedan engines) may now be removed. The roadster engines feature a separate air cleaner for each carburetor, bolted directly to the air intake flange.

Proper operation of the dashpot piston in each carburetor should be tested by lifting it gently with the finger, or with a screwdriver blade, to make sure it drops freely.

Each dashpot may now be removed in turn and the piston carefully lifted out to check that correct jet needles are fitted. (To make sure of replacing each dashpot on its respective base, both the dashpot and the base should be marked correspondingly.)

The appropriate jet needles for the various Jaguar models utilizing SU carburetors are as follows:

Model	Needle
XK 120	R.F.
XK 120M	R.F.
XK 120MC	R.G.
XK 140	S.J.
XK 140MC	V.R.
XK 150	T.L.
Mark VII	S.M.
Mark VIII	T.L.
2.4 Litre	(Solex N/A.
3.4 Litre	L.B.1

Check that the needle fits correctly so that the shoulder lies flush with the base of the piston. If it does not, loosen set screw and reposition the needle. Check, also the fit of the piston in the dashpot. The method of determining this is not mechanical but by an air leak between the O.D. of the piston and the I.D. of the dashpot. Place the piston upside down in the right hand with a finger covering the small air hole. Then, with the left hand, push the dashpot on to the piston as far as it will go. When pressure is removed, the dashpot will slowly fall until it is clear of the piston. This should take four or five seconds.

It is equally important to be sure that the jet is properly centered to the jet needle. The needle has a very fine working clearance in the jet, but it is essential that this clearance be maintained throughout the movement of the needle. If there is any point of friction, adjustment must be made from the jet. To re-center the jet on the needle, release the securing nut, take off the cap unt and turn the adjusting screw to its top position. Replace the piston and needle and feel that it is perfectly free by lifting it up with the finger. *On no account should any attempt be made to bend the needle.* The jet securing nut may now be tighened.

There is no cause for worry if the desired adjustment is not obtained at the first try; it may be necessary to slacken the securing nut several times before the clearance is right. Both patience and care will be needed to achieve proper results. When the adjustment is completed, the jet adjusting screw may be brought back to its original position.

The dashpot, piston and spindle should now be carefully wiped and refitted. *The use of metal polish and similar abrasives for cleaning purposes is a measure that can only lead to serious trouble.*

SAE 30 engine oil should be used to fill the hollow piston chamber to the top. A weak mixture when accelerating will probably be caused by lack of oil, and performance will suffer accordingly. It is therefore imperative to check the oil level every 2,500 miles and top up if required.

Another important factor in ensuring proper carburetion is the correct setting of the float levels. First remove the carburetor gasoline pipe unions at the float chambers, and also remove and clean the filters. The angle to which the forked float lever is set controls the fuel level in the float chamber, and thereafter that in the jet. The forked lever should be pressed downwards with the float chamber held inverted, placing the finger above the hinged end to ensure that the needle is in the closed position. Provided the gas level is correct, a half-inch round bar will just slide between the lever and the spigot on the lid. The lever should touch this bar at the same time as it holds the needle on the seating; if it does not, adjustment may be made by bending the lever at the point where the fork meets the straight shank. It is unnecessary to use force.

After completing re-assembly, it is advisable to lubricate the throttle controls and linkage sparingly, checking for free operation and full travel, and also for possible air leaks at the carburetor flanges. Make sure that the mounting bolts are tight.

Ignition Timing Check: Before starting to tune (synchronize) the carburetors, the ignition timing must be set correctly at the distributor. Too much advance or retard will have an adverse effect on carburetion and produce misleading results.

The number of degrees of spark advance BTDC (Before Top Dead Center) varies considerably with different Jaguar engines, as shown on the next page.

Mark VII and XK 120:
Three degrees BTDC (engine # B 4098 onwards)
Seven degrees BTDC (engine # W 5509 onwards)

NOTE: All distributors prior to # 40327-A (Mark VII) and 40199-E (XK 120) should be set at five degrees BTDC.

XK 120M:	10 degrees	BTDC
XK 120 MC:	Five degrees	BTDC
XK 140:	10 degrees	BTDC
XK 140 MC:	Five degrees	
XK 150:	Six degrees	BTDC
XK-SS:	Eight degrees	BTDC
D-Type:	Eight degrees	BTDC
2.4 Litre	10 degrees	BTDC
3.4 litre	Two degrees	BTDC
Mark VIII	Six degrees	BTDC

Synchronizing the Carburetors: With the ignition set correctly, it is important to check that *both carburetors* are sucking equally. Suction can be heard by placing a rubber tube first in one intake and then in the other while the engine is running. If there is any difference between the two sounds, adjustment is required. This may be done by loosening one of the clamp bolts on the universally jointed connection between the throttle spindles and rotating the adjusting screws until both carburetors are inhaling evenly with the engine at an idling speed of 500 rpm. The clamp bolt may now be re-tightened.

Before proceeding to the next step, it is necessary to ensure that the mixture strength in both carburetors is approximately correct. The action of the jets must be checked to make sure they are not sticking and are following the movement of the jet adjustment screws. To determine this, the jet adjustment screws are turned clockwise (upwards) as far as each will go, then rotated counter-clockwise (downwards) two and one-half turns.

The ignition is now turned on and the engine started. The strength of the mixture may be tested by raising the lifting pin of the *front* carburetor about one-quarter inch and noting the effect.

a) If the engine speed *increases* and there is a sustained faster idling speed, the mixture strength of the *rear* carburetor is too rich.

b) If the engine speed *increases* but the engine then stops, the mixture strength of the *rear* carburetor is too lean.

c) If the engine speed *increases* momentarily and then decreases, but the engine continues to run somewhat unevenly, the mixture strength of the *rear* carburetor is correct.

The process is now repeated, lifting the *rear* carburetor piston. This will permit testing the mixture setting of the front carburetor. If it is found that one of the conditions exists requiring an adjustment of mixture strength, the mixture may be *enriched* by removing the dome nut covering the jet and rotating the jet counter-clockwise (downwards). To *weaken* the mixture, the screw is turned clockwise (upwards). However, these efforts will go for nothing unless care is taken to make sure that the jets are not sticking but are following the movement of the jet adjustment screws. The dome nut should always be replaced after adjustment.

In the event that the mixture strength has been changed, it may be found necessary to slightly reset the slow running so as to maintain an even 500 rpm idling speed. If this is the case, a screwdriver may be used to rotate *both* throttle adjustment screws an exactly equal amount; otherwise the adjustments already made will be upset.

For best results, the final adjustments should be made on the road, with the air cleaner and manifold (or separate air cleaners) in place.

The final set up in this sequence of simple tune-up operations is to test the thermostatically controlled starter carburetor. To do this, the carburetor thermostat connection in the water uptake manifold is shorted to ground and the throttle flicked wide open. The engine should run at about 1,000 rpm without excessive "hunting."

The mixture setting of the starter carburetor is adjusted by rotating the hexagon nut surrounding the primer valve. A clockwise turn weakens the mixture; a counter-clockwise turn richens it.

In cold weather, if difficulty is experienced in starting because the engine fires but then dies, a weak starting mixture is obviously indicated. In that case, the engine should be tested cold and adjustment made to a richer mixture as explained above, until even running is obtained. The self-starting carburetor normally cuts out at 35° C. If it does not and the characteristic hissing is prolonged above this temperature, a temporary cure can usually be effected by quickly flicking the ignition switch off and on again. Repetition of this trouble can most likely be traced to the electric switch operated by the thermo-couple, but this type of work is best attended to by a qualified mechanic.

The foregoing hints affect only everyday running adjustments designed to keep the various Jaguar models performing satisfactorily and enhance the pleasure of ownership. Major overhauls and specialized tuning do not come within the scope of this chapter, and should not be undertaken by the owner unless he is an experienced mechanic or happens to own a repair shop equipped with proper facilities. In that event, the Jaguar shop manuals will supply detailed guidance.

The XK Dunlop Disc Brakes: Actual or prospective owners of the Jaguar XK 150 may find the following information (relating to the maintenance of the new disc brakes) of practical value. A description of the system is not involved, nor is it thought necessary to enter into a technical discussion of operating procedures. The purpose of this information is to afford the reader up-to-date guidance in priming and bleeding the new brake system, together with some details on installation and servicing.

Installation

The assembly of the disc brake to the car should be carried out as follows:

(1) Secure disc to the hub. Five bolts are provided secured by spring washers and nuts.

(2) Fit the hub to the stub axle or half shaft as applicable and adjust according to shop manual instructions.

(3) Check disc for true rotation by clamping a dial test indicator to chassis so that the needle pad bears on face of disc. "Run-out" should not exceed .006-in gauge reading. Manufacturing tolerances on disc and hub should maintain this truth and in event of run-out exceeding the above value, the components should be examined for damage.

(4) Locate the caliper body (complete with cylinder assemblies) in position and secure with two bolts fitted with Shakeproof washers.

(5) Check the gap between each side of caliper and disc. Difference should not exceed .010-in., and shims may be fitted to centralize caliper.

(6) If not already fitted, install the bridge pipe connecting the two cylinder assemblies. Connect hose to cylinder block and ensure that it is properly secured.

Hand Brake

(1) Slacken carrier adjuster bolt, position the carriers on rear caliper and secure them with the bolts and lockwashers. Set brake clearance by tightening adjuster bolt until pads are lightly in contact with disc and then slacken bolt one-third turn. This clearance should be reset when travel of hand brake becomes excessive.

Priming and Bleeding the Brake System

The following procedure should be adopted, whether for initial priming of the system, or to bleed in service if air has been permitted to enter. This may occur if connections are not kept properly tightened, or if master cylinder periodic fluid level check is neglected. During bleeding it is important that the level in reservoir be kept topped up to avoid drawing air into system. Use new fluid for this purpose, but if not possible, return the original fluid to reservoir, providing it is clean and free from air.

(1) Check that all connections are tightened and all bleed screws closed.

(2) Fill reservoir with brake fluid of the correct specification.

(3) Attach bleeder tube to bleed screw on near side rear brake and immerse open end of tube in a small quantity of brake fluid contained in a clean glass jar. Slacken the bleed screw and operate brake pedal slowly backwards and forwards through its full stroke until fluid pumped into jar is reasonably free from air bubbles. Keep pedal depressed and close bleed screw. Release pedal.

(4) Repeat for each brake in turn.

(5) Repeat complete bleeding sequence until brake fluid pumped into jar is completely free from air bubbles.

(6) Lock all bleed screws and finally regulate fluid level in reservoir.

(7) Apply normal working load on brake pedal for period of two or three minutes and examining entire system for leaks.

General Servicing

(1) The complete brake system is designed to require a minimum of attention. Providing the hydraulic fluid in the reservoir is kept at recommended level, no defects should normally occur. Fluid loss must be supplemented by periodically topping up with fluid of the same specification as that in system. When alternate fluids are specified, the complete system should be drained before substituting one fluid for another. On no account should hopping-up be carried out with an alternative approved brand of fluid.

(2) The inclusion of air in the system will be indicated by sluggish response of the brakes and the spongy action of the brake pedal. This may be due to air induction at a loose joint or at the reservoir in which fluid has been allowed to fall to a very low level. The defects must be remedied immediately and the

system completely bled as explained above. Similarly, bleeding the system is equally essential following any servicing operation involving disconnection of part or whole of the hydraulic system.

(3) The following instructions detail the procedure for the renewal of component parts and for the complete overhaul of the disc brakes, hand brakes, and master cylinder. The units should be thoroughly cleaned externally before dismantling. Brake system fluid should be used for cleaning internal components, and, except where otherwise stated in these notes, the use of gasoline, paraffin or chemical grease solvents should be avoided as they may be detrimental to rubber components. Throughout the dismantling and assembling operation it is essential that the work bench be maintained in clean condition and that components are not handled with dirty or greasy hands. Precision parts must be handled with extreme care and carefully put aside from tools or other equipment likely to cause damage. After cleaning, the components should be dried with clean lint-free rag.

(4) If it is not intended to renew the rubber components, these must be carefully examined for serviceability. There must be no evidence of defects such as perishing, excessive swelling, cutting or twisting. Where there is any doubt, comparison with new parts may be of assistance. The flexible pipes must show no signs of deterioration or damage and the bores must be cleaned with a jet of compressed air. No attempt should be made to clear blockage by probing, as this may result in damage to the lining and serious restriction to fluid flow. Partially or totally blocked flexible pipes should always be renewed. When removing or re-fitting a flexible pipe the end sleeve hexagon must be held with the appropriate wrench to prevent the pipe from twisting. A twisted pipe will prove detrimental to efficient brake operation.

Renewing the friction pads

Brake adjustment is automatic during the wearing life of the pads. As the pads wear, the outer ends of the retractor pins will withdraw into the cylinder block and can be used to gauge pad wear. When the end of the pin is approximately 5/16-in. below the face of the block the pads should be renewed. If checking is neglected the need to renew the pads will be indicated by a loss of brake efficiency. To fit new pads the following procedure must be observed:

(1) Remove bridge pipes, plug open end of the hose and drain the cylinder blocks.

(2) Unscrew securing bolts and remove the cylinder blocks complete with piston and pad assemblies.

(3) Press carrier plate and cylinder block firmly together to press piston back into cylinder, and reset retractor pins. This is done by pressing pin heads into their recesses in the carrier plate and holding them in this position. Care must be taken that the retaining springs are pressed well home into their housings on the outer face of the block.

(4) Carefully pry the pad from the carrier plate using a sharp knife and clean away any traces of cement from the face of the plate. During this operation it is important to avoid twisting the carrier plate relative to the block as this may distort the retractor pins. Trichlorethylene may be used to clean the carrier plate, but should be used sparingly and must not be allowed to come in contact with rubber components.

(5) Lightly smear the annular face of the carrier plate with Dunlop General Purpose Cement, taking care not to smear the raised center portion of plate.

(6) Press the pad firmly to the plate, ensuring correct location of alignment screw, and remove all traces of excess cement which may be squeezed out. Cement deposit on the caliper bore may impair brake efficiency.

(7) Re-assemble the cylinder block to the caliper body, making sure that the Shakeproof washers are serviceable.

(8) Fit the bridge pipes and connect to hoses and bleed system.

Renewing the brake piston seals

Leakage past the piston seals will be donated by a fall in level in the fluid reservoir or by spongy pedal travel. It is recommended that the dust excluder be renewed when fitting a new piston seal. Procedure is as follows:

(1) Remove the cylinder block as described in *Renewing the friction pads.*

(2) Carefully press out retractor pins using a 3/32-in. parallel punch (although it is preferable to do this with a press, a hammer may be used provided care is taken to tap gently). Remove the carrier plate and temporarily return the pins to their housings.

(3) Disengage the dust seal from cylinder block and withdraw the pin assembly.

(4) Carefully pry off the piston seal retaining washer (this washer is a press fit on inner face of piston) and remove the seal.

(5) Remove the dust seal from the ball joint plug.

(6) Fit new dust seal in position under the shoulder of the ball joint plug, taking care to avoid harmful stretching and to ensure that the rubber lip is not trapped or twisted.

(7) When a new piston seal is installed, it must be lightly lubricated with brake fluid and fitted to piston. Press the retaining washer on to piston and lightly peen over at three points.

(8) Clean the cylinder bore and ensure that there are no scores which will damage the seal. Insert the piston into the cylinder and spring the outer rim of the dust seal into its housing.

(9) Locate the carrier plate, refit the retractor pins and reset as in *Renewing friction pads* (3).

(10) Complete the re-assembly as in *Renewing friction pads* and bleed the system as already described.

Relining the hand Brake

The recommended procedure for renewing the friction pads is as follows:

(1) Unscrew and remove the adjuster bolt and locknut and swing the pad carriers away from disc.

(2) Remove the split pin and withdraw the lever pivot pin.

(3) Remove bifurcated rivets from both carriers and pry off the worn linings.

(4) Position the new linings and secure them with new bifurcated rivets.

(5) Place the lever against the inner carrier. Hold the locknut firmly against the outer face of the trunnion and screw in the adjuster bolt until three or four threads engage the locknut.

(6) Align the holes in the lever and pivot seat, fit the pivot pin and lock it with a split pin.

(7) Reset the clearance as described in *Hand brake.*

Renewing the master cylinder seals

The following is the recommended procedure for renewal of the seals:

(1) Ease dust excluder clear of the head of master cylinder.

(2) Remove the circlip with suitable pliers; this will release the push rod, complete with dished washer.

(3) Withdraw the piston and remove the cup seal.

(4) Withdraw the valve assembly complete with springs and supports. Remove the valve sealing from the bush.

(5) Lubricate the new seals with brake fluid, fit the valve seal around the bush and fit the cup seal in the groove around the piston.

(6) Place the seal bush in position on the valve stem and insert the piston into the spring support, ensuring that the head of the valve engages the piston bore.

(7) Slide the complete assembly into the cylinder body, taking particular care not to damage the lip of the cup seal.

(8) Position the push rod and depress the piston sufficiently to allow the dished washer to seat on the shoulder at the head of the cylinder. Fit the circlip and check that it fully engages the groove.

(9) Fill the dust excluder with clean Wakefield No. 3 Rubber Grease.

(10) Reseat the dust excluder around the head of the master cylinder.

You are now ready to stop on a dime.

8. SPECIFICATIONS AND PERFORMANCE DATA

Table I	XK 120
II	XK 120-M
III	XK 120-MC
IV	XK 140
V	XK 140-MC
VI	XK 150, XK 150 S
VII	XK-SS
VIII	C-Type
IX	D-Type
X	Mark V (2½ litre) Mark V (3½ litre)
XI	Mark VII Mark VIII
XII	Mark IX
XIII	3.4 Sedan

Table I—XK 120

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	8:1
Maximum output	160 bhp @ 5,400 rpm
Valves	DOHC
Carburetors	Twin Su side-draft
Transmission	Four-speed (Synchromesh 2,3,4,)
Overall ratios	High: 3.54
	Third: 4.84
	Second: 7.01
	First: 11.95
Rear axle ratio	3.54
Mph per 1,000 rpm (High)	23
Turning diameter	31 ft
Tire size	6.00 x 16
Brake lining area (sq. in.)	207
Brake type	Drum
Weight (curb)	3,200 lbs
Gas tank capacity (US gallons)	18

DIMENSIONS

Wheelbase	102-in
Tread (front)	51-in
(rear)	50-in
Overall length	173-in
Width	63-in
Height (top raised)	51-in
Ground clearance	7⅛-in

PERFORMANCE FACTORS

0- 30 mph	4.0 secs
0- 40 mph	6.0 secs
0- 50 mph	8.2 secs
0- 60 mph	11.8 secs
0- 80 mph	15.7 secs
0-100 mph	27.3 secs
Standing Quarter Mile	18.0 secs
Maximum speed	124 mph
Maximum torque (lbs/ft @ rpm)	195 @ 2,500
Bhp per cu. in	.76
Lbs per bhp	20
Gas consumption	14-17 mpg

SUGGESTED PRICE POE

Roadster	$3,345

Table II—XK 120M

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	8:1
Maximum output	180 bhp @ 5,300 rpm
Valves	DOHC
Carburetors	Twin SU side-draft
Transmission	Four-speed (Synchromesh 2,3,4)
Overall ratios	High: 3.77
	Third: 5.16
	Second: 7.48
	First: 12.73
Rear axle ratio	3.77
Mph per 1,000 rpm (High)	21.6
Turning diameter	31 ft.
Tire size	6.00 x 16
Brake lining area (sq. in.)	207
Brake type	Drum
Weight (curb)	3,250 lbs
Gas tank capacity (US gallons)	18

DIMENSIONS

Wheelbase	102-in
Tread (front)	51-in
(rear)	50-in
Overall length	173-in
Width	63-in
Height (top raised)	51-in
Ground clearance	7⅛-in

PERFORMANCE FACTORS

0- 30 mph	3.8 secs
0- 40 mph	5.2 secs
0- 50 mph	7.1 secs
0- 60 mph	10.0 secs
0- 80 mph	
0-100 mph	
Standing Quarter Mile	16.9 secs
Maximum speed	130 mph
Maximum torque (lbs/ft @ rpm)	203 @ 3,500
Bhp per cu. in	.86
Lbs per bhp	18.05
Gas consumption	14-17 mpg

SUGGESTED PRICE POE

Roadster	$3,545

Table III—XK 120MC

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	8:1
Maximum output	210 bhp @ 5,750 rpm
Valves	DOHC
Carburetors	Twin SU side-draft
Transmission	Four-speed (Synchromesh 2,3,4)
Overall ratios	High: 3.54
	Third: 4.83
	Second: 7.01
	First: 11.95
Rear axle ratio	3.54
Mph per 1,000 rpm (High)	23.1
Turning diameter	31 ft
Tire size	6.00 x 16
Brake lining area (sq. in.)	207
Brake type	Drum
Weight (curb)	3,275 lbs
Gas tank capacity (US gallons)	18

DIMENSIONS

Wheelbase	102-in
Tread (front)	51-in
(rear)	50-in
Overall length	175-in
Width	63-in
Height (top raised)	51-in
Ground clearance	7⅛-in

PERFORMANCE FACTORS

0- 30 mph	2.7 secs
0- 40 mph	4.2 secs
0- 50 mph	6.5 secs
0- 60 mph	8.4 secs
0- 80 mph	15.7 secs
0-100 mph	25.9 secs
Standing Quarter Mile	16.2 secs
Maximum speed	125 mph
Maximum torque (lbs/ft @ rpm)	213 @ 4,000
Bhp per cu. in	1.0
Lbs per bhp	15.57
Gas consumption	16-18 mpg

SUGGESTED PRICE POE

Roadster	$3,745

Table IV—XK 140

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	8:1
Maximum output	190 bhp @ 5,500 rpm
Valves	DOHC
Carburetors	Twin SU side-draft
Transmission	Four-speed (Cynchromesh 2,3,4)
Overall ratios	High: 3.54
	Third: 4.83
	Second: 7.01
	First: 11.95
Rear axle ratio	3.54
Mph per 1,000 rpm (High)	23.1
Turning diameter	33 ft
Tire size	6.00 x 16
Brake lining area (sq. in.)	207
Brake type	Drum
Weight (curb)	3,275
Gas tank capacity (US gallons)	16¾

DIMENSIONS

Wheelbase	102-in
Tread (front)	51-in
(rear)	50-in
Overall length	176-in
Width	64.5-in
Height	53.5-in
Ground clearance	8.13-in

PERFORMANCE FACTORS

0- 30 mph	3.2 secs
0- 40 mph	4.5 secs
0- 50 mph	7.5 secs
0- 60 mph	11.0 secs
0- 80 mph	17.3 secs
0-100 mph	29.5 secs
Standing Quarter Mile	18.5 secs
Maximum speed	120 mph
Maximum torque (lbs/ft @ rpm)	203 @ 3,000
Bhp per cu. in	.90
Lbs per bhp	17.23
Gas consumption	16-18 mpg

SUGGESTED PRICE POE

Roadster	$3,595

Table V—XK 140MC

ENGINE & CHASSIS	
Cylinders	**6**
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	8:1
Maximum output	210 bhp @ 5,750 rpm
Valves	DOHC
Carburetors	Twin SU side-draft
Transmission	Four-speed (Synchromesh 2,3,4)
Overall ratios	High: 3.54
	Third: 4.83
	Second: 7.01
	First: 11.95
Rear axle ratio	3.54
Mph per 1,000 rpm (High)	23.1
Turning diameter	33 ft
Tire size	6.00 x 16
Brake lining area (sq. in.)	207
Brake type	Drum
Weight (curb)	3,275 lbs
Gas tank capacity (US gallons)	16¾
DIMENSIONS	
Wheelbase	102-in
Tread (front)	51-in
(rear)	50-in
Overall length	176-in
Width	64.5-in
Height	53.5-in
Ground clearance	8.13-in
PERFORMANCE FACTORS	
0- 30 mph	2.7 secs
0- 40 mph	4.2 secs
0- 50 mph	6.5 secs
0- 60 mph	8.4 secs
0- 80 mph	15.7 secs
0-100 mph	26.5 secs
Standing Quarter Mile	16.6 secs
Maximum speed	125 mph
Maximum torque (lbs/ft @ rpm)	213 @ 4,000
Bhp per cu. in	1.0
Lbs per bhp	15.57
Gas consumption	16-18 mpg
SUGGESTED PRICE POE	
Roadster	$3,910

Table VI—XK 150

ENGINE & CHASSIS	**XK-150 COUPE**	**XK 150 S ROADSTER**
Cylinders	6	6
Bore	3.27-in	3.27-in
Stroke	4.17-in	4.17-in
Displacement	210 cu. in.	210 cu. in.
Compression ratio	8:1	9:1
Maximum output	210 bhp @ 5,500 rpm	250 bhp @ 5,500 rpm
Valves	70° DOHC	70° DOHC
Carburetors	Twin SU-HD6 side-draft	3 HD8 S.U.
Transmission	Four-speed (Synchromesh 2, 3, 4)*	with OD
Overall ratios	High: 3.54 Third: 4:54 Second: 6:58 First: 11:95	
Rear axle ratio	3.54	4.09
Mph per 1,000 rpm (High)	22.70	
Turning diameter	33 ft	33 ft
Tire size	6.00 x 16	6.00 x 16
Brake lining area (sq. in.)	Dunlop single pad disc	
Brakes	with servo assistance	Same
Disc Diameter	12 in.	12 in
Weight.. (Dry)	2,912 lbs.	2,744 lbs.
Gas tank capacity (US gallons)	16¾	16.8

*Overdrive (High 3.18) or Borg-Warner automatic optional.

DIMENSIONS		
Wheelbase	102 in.	102 in.
Tread (Front)	51-⅝ in.	51-⅝ in.
(Rear)	51.58 in.	51.58 in.
Overall length	177 in.	176 in.
width	64.5 in.	64.5 in.
height	55 in.	55-½ in.
Ground Clearance	7-⅛ in.	7-⅛ in.

PERFORMANCE FACTORS		
0-30 mph	2.8 secs.	2.5 secs.
0-40 mph		4.0 secs.
0-50 mph	6.5 secs.	5.6 secs.
0-60 mph	8.5 secs.	7.3 secs.
0-80 mph	15.0 secs.	13.0 secs.
0-100 mph	25.1 secs.	21.4 secs.
Standing Quarter Mile	16.9 secs.	15.1 secs.
Maximum speed	125 mph	Approx. 140 mph
Maximum torque (lbs/ft @ rpm)	215	240 @ 4500
Bhp per cu. in.	1.	1.19
Lbs per bhp		
Gas consumption	17-19 mpg	14-16 mpg

SUGGESTED PRICE POE		
Coupe	$4,500	
Convertible	4,620	
Roadster	4,520	
Roadster "5"		$5,120

Table VII—XK-SS

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	9:1
Maximum output	262 bhp @ 6,000 rpm
Valves	DOHC
Carburetors	Three Weber Twin-choke
Transmission	Four-speed (Synchromesh)
Overall ratios	High: 3.77
	Third: 4.82
	Second: 6.18
	First: 8.06
Rear axle ratio	3.77*
Mph per 1,000 rpm (High)	
Turning diameter	
Tire size	6.50 x 16
Brake lining area (sq. in.)	75
Brake type	Disc
Weight (curb)	2,450 lbs
Gas tank capacity (US gallons)	

*Optional ratios: 2.92 and 3.31

DIMENSIONS

Wheelbase	90.6-in
Tread (front)	50-in
(rear)	48-in
Overall length	154-in
Width	65.5-in
Height (scuttle)	32-in
Ground clearance	5.5-in

PERFORMANCE FACTORS

0- 30 mph	
0- 40 mph	
0- 50 mph	
0- 60 mph	6.4 sec
0- 80 mph	
0-100 mph	15.6 sec
Standing Quarter Mile	14.5 sec
Maximum speed	138 mph
Maximum torque (lbs/ft @ rpm)	
Bhp per cu. in	1.24
Lbs per bhp	9.3
Gas consumption	10 mpg

SUGGESTED PRICE POE

Roadster	$5,600

Table VIII—C-Type

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ration	8:1
Maximum output	210 bhp @ 6,000 rpm
Valves	DOHC
Carburetors	Twin SU (two-inch) side-draft*
Transmission	Four-speed (Synchromesh 2,3,4)
Overall ratios	High: 3.92
	Third: 4.72
	Second: 6.85
	First: 11.70
Rear axle ratio	3.92*
Mph per 1,000 rpm (High)	21.4
Turning diameter	
Tire size	6.50 x 16
Brake lining area (sq. in.)	207
Brake type	Drum
Weight (curb)	2,550 lbs
Gas tank capacity (US gallons)	50

*Three Weber Twin-choke optional.

**Optional. Regular: 3.31

DIMENSIONS

Wheelbase	96-in
Tread (front)	51-in
(rear)	50-in
Overall length	
Width	
Height	
Ground clearance	

PERFORMANCE FACTORS

0- 30 mph	2 0 secs
0- 40 mph	3.3 secs
0- 50 mph	5.0 secs
0- 60 mph	6.6 secs
0- 80 mph	11.0 secs
0-100 mph	16.8 secs
Standing Quarter Mile	15.25 secs
Maximum speed	141 mph
Maximum torque (lbs/ft @ rpm)	220 @ 4,000
Bhp per cu. in	1.
Lbs per bhp	12.14
Gas consumption	14-20 mpg

SUGGESTED PRICE POE

Roadster	$5,860

Table IX—D-Type

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	210 cu. in
Compression ratio	9:1
Maximum output	250 bhp @ 6,000 rpm
Valves	DOHC
Carburetors	Three Webster Twin-choke
Transmission	Four-speed (Sychromesh)
Overall ratios	High: 2.79*
	Third: 3.57
	Second: 4.58
	First: 5.98

Rear axle ratio	2.79*
Mph per 1,000 rpm (High)	23.2
Turning diameter	32 ft
Tire size	7.00 x 16
Brake lining area (sq. in.)	75
Brake type	Disc
Weight (curb)	2,300 lbs
Gas tank capacity (US gallons)	45

*3.73 optional

DIMENSIONS

Wheelbase	90.6-in
Tread (front)	50-in
(rear)	48-in
Overall length	154-in
Width	65.37-in
Height (scuttle)	32-in
Ground clearance	5.5-in

PERFORMANCE FACTORS

0- 30 mph	
0- 40 mph	
0- 50 mph	3.9 secs
0- 60 mph	4.7 secs
0- 80 mph	8.0 secs
0-100 mph	12.1 secs
Standing Quarter Mile	13.7 secs
Maximum speed	162 mph
Maximum torque (lbs/ft @ rpm)	242 @ 4,000
Bhp per cu. in.	1.19
Lbs per bhp	9.2
Gas consumption	10 mpg

SUGGESTED PRICE POE

Roadster	$9,875

Table X—Mark V

ENGINE & CHASSIS	**(2½ litre)**	**(3½ litre)**
Cylinders	6	6
Bore	2.85-in	3.27-in
Stroke	4.17-in	4.18-in
Displacement	163.5 cu. in.	212.5 cu. in.
Compression ratio	7.3:1	6.75:1
Maximum output	102 bhp @ 4,600 rpm	125 bhp @ 4,250 rpm
Valves	OH-Pushrod	OH-Pushrod
Carburetors	Twin SU side-draft	Twin SU side-draft
Transmission	Four-speed synchromesh	Four-speed synchromesh
Overall ratios		
High:	4.55	4.30
Third:	6.21	5.87
Second:	9.01	8.52
First:	15.35	14.50
Rear axle ratio	4.55	4.30
Mph per 1,000 rpm (High)		
Turning diameter	35 ft	35 ft
Tire size	6.70 x 16	6.70 x 16
Brake lining area (sq. in.)	184	184
Brake type	Drum	Drum
Weight (curb)	3,696 lbs	3,696 lbs
Gas tank capacity (US gallons)	16¾	16¾
DIMENSIONS		
Wheelbase	120-in	120-in
Tread (front)	56-in	56-in
(rear)	57.5-in	57.5-in
Overall length	187.5-in	187.5-in
width	69.5-in	69.5-in
height	57.5-in	57.5-in
Ground clearance		
PERFORMANCE FACTORS		
0-30 mph		4.9 secs
0-40 mph		7.1 secs
0-50 mph		9.9 secs
0-60 mph		14.7 secs
Standing Quarter Mile		20.2 secs
Maximum speed		90.7 mph
Maximum torque (lbs/ft @ rpm)		
Bhp per cu. in	.63	.59
Lbs per bhp	36.2	29.6
Gas consumption	22 mpg	18 mpg
SUGGESTED PRICE POE		
	Sedan	$2,794

Table XI—Mark VII and Mark VIII (3½ litre)

ENGINE & CHASSIS	**MARK VII**	**MARK VIII**
Cylinders	6	6
Bore	3.27-in.	3.27-in.
Stroke	4.17-in.	4.17-in.
Displacement	3442 cc	3442 cc
Compression ratio	8:1	8:1
Maximum output	190 bhp	210 bhp
Valves	70° DOHC	70° DOHC
Carburetors	Twin S.U. HD6	Twin S.U. HD6
Transmission	Four-speed synchromesh	Four-speed synchromesh
Overall ratios		
High:	4.27	4.27
Third:	5.84	5.16
Second:	8.46	7.47
First:	14.43	12.73
Rear Axle ratio	4.27	4.27
Mph per 1,000 rpm (High)	19.35	19.35
Turning diameter	36 ft.	36 ft.
Tire size	6.70 x 16	6.70 x 16
Brake lining area (sq. in.)	179 sq. ins.	179 sq. ins.
Brake type	Drum	Drum
Weight (dry)	3,696 lb.	3,808 lb.
Gas tank capacity (US gallons)	20½	20½
DIMENSIONS		
Wheelbase	120-in.	120-in.
Tread (front)	56.5-in.	56.5-in.
(rear)	58-in.	58-in.
Overall length	196.5-in.	196.5-in.
width	73-in.	73-in.
height	63-in.	63-in.
Ground clearance	7½-in.	7½-in.
PERFORMANCE FACTORS		
0-30 mph	3.9 secs.	
0-40 mph	5.7 secs.	
0-50 mph	8.4 secs.	
0-60 mph	11.6 secs.	
Standing Quarter Mile	18.35 secs.	
Maximum speed	105 mph	110 mph
Maximum torque (Lbs/ft @ rpm)		
Bhp per cu. in.	.901	1.
Lbs per bhp		
Gas consumption	16-18 mpg	16-18 mpg
SUGGESTED PRICE POE		
Sedan	$4,275	$5,610

Table XII—Mark IX

ENGINE & CHASIS

Cylinders	6
Bore	87 mm
Stroke	106 mm
Displacement	3,781 cc
Compression ratio	8:1
Maximum output	225 bhp
Valves	70° DOHC
Carburetors	Twin S.U. HD6
Transmission	Borg Warner Automatic
Overall ratios	

High:	4.27
Intermediate Range:	From 13.2 to 6.14
Low Range:	From 21.2 to 9.86

Rear axle ratio	4.27
Mph per 1,000 rpm (High)	
Steering	Power Assisted
Turning diameter	36 ft.
Tire Size	6.70 x 16
Brake lining area (sq. in.)	
Brake Type	Disc
Weight (Dry)	3808 lbs.
Gas Tank Capacity (US Gallons)	20½

DIMENSIONS

Wheelbase	120-in
Tread (front)	56.5-in
(rear)	58-in
Overall length	196.5-in
Width	73-in
Height	63-in
Ground Clearance	7½-in

PERFORMANCE FACTORS

0-30 mph	
0-40 mph	
0-50 mph	
0-60 mph	
Standing Quarter Mile	
Maximum speed	115 mph
Maximum torque (lbs/ft @ rpm)	
Bhp per cu. in.	
Llbs per bhp	
Gas consumption	16-18 mpg

SUGGESTED PRICE TOE

Sedan	$5,960

Table XIII—3.4 Sedan

ENGINE & CHASSIS

Cylinders	6
Bore	3.27-in
Stroke	4.17-in
Displacement	3,442 cc
Compression ratio	8:1
Maximum output	210 bhp @ 5,500 rpm
Valves	70° DOHC
Carburetors	Twin SU-HD6
Transmission	Four-speed with Overdrive*
Overall ratios	High: 3.77 Third: 4.55 Second: 6.56 First: 11.2
Rear axle ratio	3.77
Top gear ratio in overdrive	2.93
Mph per 1,000 rpm (High)	19.35
Turning diameter	33′6″
Tire size	6.40 x 15-in
Brake lining area (sq. in.)	
Brake type	11¼″ Disc
Weight (dry)	3,136 lbs
Gas tank capacity (US gallons)	14.4

*Borg-Warner automatic optional

DIMENSIONS

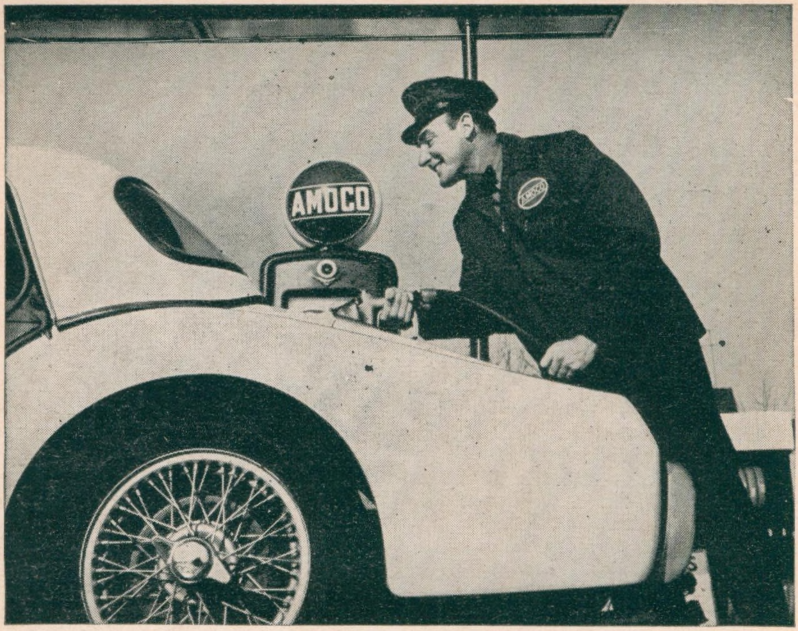
Wheelbase	107⅜-in
Tread (front)	54⅝-in
(rear)	50⅛-in
Overall length	180.75-in
Width	66.75-in
Height	57.5-in
Ground Clearance	7-in

PERFORMANCE FACTORS

0- 30 mph	3.0 secs
0- 40 mph	5.4 secs
0- 50 mph	7.2 secs
0- 60 mph	9.5 secs
0- 80 mph	19.3 secs
0-100 mph	
Standing Quarter Mile	17.8 secs
Maximum speed	approx. 120 mph
Maximum torque (lbs/ft @ rpm)	215 @ 3,000
Bhp per cu. in	1.
Lbs. per bhp	
Gas consumption	22-24 mpg

SUGGESTED PRICE POE

Sedan	$4,567



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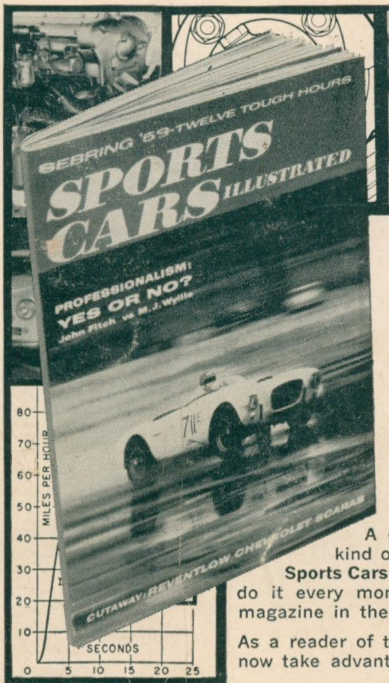
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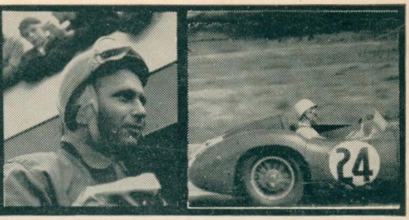

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